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YAWS AND SYPHILIS.

ARAUJO (Oscar da Silva). Le pian au Brésil. [**Yaws in Brazil.**]—*Bull. Soc. Path. Exot.* 1928. May 9. Vol. 21. No. 5. pp. 387–400.

After referring to the confusion which has existed in the past as to the meaning of the word " la bouba " and the non-differentiation of yaws, syphilis, tuberculosis, and leishmaniasis, the author deals with the distribution of yaws in Brazil. He is opposed to the idea that the disease existed in Brazil at the time of the discovery of that country by the Portuguese in 1500, and is of opinion that it was introduced later with African slaves. The malady is less widespread along the littoral than inland, but has been met with both in hilly country and on the plains. It is widespread in many provinces, but varies greatly in intensity. In Parahyba and Ceará the incidence is greatest. In the former 30,000 cases are estimated in a population of 1,200,000. All races are attacked, the proportions being :—18·4 per cent. whites, 15·2 per cent. negroes, 56·2 per cent. half-castes, 10 per cent. Indian natives, that is to say, when the several populations are taken into account, about equally among all. The author finds *T. pertenue* more superficially in lesions and in greater numbers than *T. pallida*. Monkeys are infected with a mean incubation period of 38 days ; rabbits by intratesticular route in 56 days. Superinfection is possible during the incubation period and after the appearance of the primary lesion. An attack of generalized yaws confers immunity. Cases of yaws have been observed to develop in persons suffering from active syphilis. The writer cannot subscribe to the idea that yaws and syphilis are mutations of the same infection as suggested by BUTLER and PETERSON, BORY, MÜLLER and others, and holds that the distribution of the two diseases in Brazil is direct evidence to the contrary.

On the clinical side the descriptions of lesions met with do not differ from those given by other authors ; he describes under skin eruptions non-vegetating forms : roseola, pityriasis, papulo-erosive, lichenoid, papulo-squamous, psoriasiform, papulo-pustular, crusted papular and keratoid ; under vegetating forms—framboesoid, condylomatoid, verrucose. Lesions of mucous membranes do not occur, neither do lesions of the eyes or viscera, and alopecia was never observed ; glandular enlargement on the other hand is common. The author argues against the division of symptoms into three periods in yaws since there is no definite chronological evolution of its manifestation. Gummatous ulcerations have never been observed in yaws patients except in cases of secondary infections or coexisting syphilis. J.A.N.

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have not been noted among sufferers from framboesia; on the other hand 60 cases have been seen among syphilitics. Gangosa, too, the author excludes from among yaws manifestations. In none of six cases of goundou seen in Brazil was there any evidence of yaws. B.-W. reaction was always positive in eruptive cases, negative after treatment; the cerebrospinal fluid is always normal; the blood shows a constant increase in large mononuclears. Treatment by potassium iodide intravenously gave good results but the best were obtained with 606 and 914 and other arsenicals. Tartar emetic failed, methylene blue was not satisfactory and bismuth preparations disappointing.

H. S. Stannus.

Leger (Marcel). Le pian et sa quasi-disparition de certains pays de l'Amérique. [**The Apparent Disappearance of Yaws from some American Countries.**]—*Bull. Soc. Path. Exot.* 1928. June 13. Vol. 21. No. 6. pp. 428–432. [13 refs.]

The author, after referring to the observation of Araujo that yaws was widespread in certain provinces of Brazil and rare in others, points out that the same is true elsewhere, and that in French Guiana, Guadeloupe and Martinique the disease, which was at one time common, at the present time may be said hardly to exist. The disease was introduced into Guiana by African slaves; Bajon (in 1777) described the disease as commonly seen. Clarac (1902) found it rare except among imported Indians and Africans. Between 1917–19, after careful investigation, the author only found three cases by bacteriological diagnosis, since when no cases have been reported in the annual medical reports from French Guiana. Similarly in British Guiana yaws, which had been formerly widespread, was reported by Daniels in 1896 to have disappeared. [It was present in British Guiana in 1925.—J. F. C. H.] On the contrary in Dutch Guiana, which is sandwiched in between the British and French colonies, yaws persists, affecting large numbers. The frequency of infections in Guadeloupe was testified in 1725 by Père Labat, who stated that the disease was well known to the native Carib population before the advent of African slaves; now the disease is unknown. In Martinique it persists in certain areas. In Barbadoes, however, the disease has almost disappeared, while still found widespread in other of the British West Indian islands. These strange facts offer a field for investigation; the forces at work in causing this patchy disappearance of framboesia are still unknown.

H. S. S.

Bulletin de la Société de Pathologie Exotique. 1928. Apr. 18. Vol. 21. No. 4. pp. 277–281. [Municipal Polyclinic, Saigon.]—Conférence sur l'évolution clinique du pian. [**The Clinical Development of Yaws.**]

An account of a lantern demonstration (74 slides) showing the clinical evolution of yaws as seen in Cochin China. The author insisted on the morphological resemblance of the primary lesion to the primary chancre of syphilis, at the same time pointing out the many differences. He also insists on the prurigenous character of all framboesial lesions. The secondary stage is characterized occasionally by the appearance of a roseola often missed and then by a macular

eruption consisting of minute raised furfuraceous papules having the appearance of keratosis pilaris, but in reality minute yaws, most of which disappear spontaneously before the development of the few into florid secondary lesions. Some secondary lesions are tuberculo-papular and others psoriasiform in character. Hyperkeratosis of the palms and soles with fissuring and ringworm-like lesions are common throughout this period. The tertiary period is characterized by ulcerative gummatous lesions of soft parts and bones, a rarifying osteitis as shown by X-ray examination, being characteristic.

H. S. S.

CORDES (Wilhelm). *Lichen spinulosus*, **a Manifestation of Late Framboesia.**—*Sixteenth Ann. Rep. Med. Dept. United Fruit Company, Boston, Mass.* 1927. pp. 168–170. With 1 text fig. [United Fruit Co. Hosp., Preston, Cuba.]

Among 110 patients in the Preston Hospital, Cuba, during the year, who showed symptoms or gave a history of yaws, two presented the condition called *Lichen spinulosus seu pilaris*, a condition considered to be practically identical with *Keratosis pilaris*. They were male Haitians aged 25 and 55 years who had contracted yaws in childhood. Meinicke test + + +. After treatment with bismuth and neosalvarsan the itching ceased, but there was no change in the lesion during 3 and 4 weeks. A section of skin examined showed " slight papillary outgrowth of the corium with lymphocytic infiltration around the blood-vessels—also marked hyperkeratosis at the mouths of the hair follicles."

H. S. S.

CHOPRA (R. N.), GUPTA (J. C.) & MULLICK (M. N.). **A New Organic Aromatic Compound of Bismuth Suitable for Intravenous Injection in the Treatment of Framboesia.**—*Indian Med. Gaz.* 1928. July. Vol. 63. No. 7. pp. 361–363. [4 refs.] [School of Trop. Med., Calcutta.]

As the result of enquiries by the authors for a safe compound of bismuth for intravenous use Dr. GHOSE has prepared a bismuth analogue of urea-stibamine containing just over 50 per cent. of bismuth which has been given the name of Bisnene and to which has been assigned the following formula: NH_2-CO-NH-C_6H_4BiO-(OH)ONO. Doses of 0·1 to 0·15 gm. have been tried in a few cases of yaws with promising results, 4 injections at weekly intervals being followed by the disappearance of the secondary eruption.

H. S. S.

PORTOIS. Le traitement du pian par l'oxyiodogallate de bismuth. [**Treatment of Yaws by Airol.**]—*Bull. Méd. du Katanga.* 1928. Vol. 5. No. 1 & 2. pp. 15–16.

Three years ago the author drew attention to the many advantages possessed by oxyiodogallate of bismuth (" airol ") in the treatment of yaws. 20 grams of airol are triturated with 100 each of glycerin and water, a little at a time, to make an even paste before adding the whole. A series of 10 weekly injections of 1–4 cc., according to age, is given intramuscularly. A small quantity of iodine is liberated in the

preparation which obviates sterilizing the mixture. The advantages claimed are small cost, ease of preparation, ease of administration compared with oily preparations; sterilization is dispensed with, yet sepsis never occurs (7,000 injections). The W. R. is rendered negative almost as quickly as with "914." Stomatitis is very rarely produced (5 cases among the 1,000 patients).

H. S. S.

SCHÖBL (Otto). **Experimental Yaws in Philippine Monkeys and a Critical Consideration of our Knowledge concerning Framboesia Tropica in the Light of Recent Experimental Evidence.**—*Philippine Jl. Sci.* 1928. Mar. Vol. 35. No. 3. pp. 209–332. With 1 text fig. & 30 plates. [32 refs.]

In view of the conflicting results obtained by early workers in this field the urgent necessity for further investigation and experimental work in connexion with yaws has several times been alluded to in these columns. During the past year a most valuable series of papers by Schöbl and his colleagues have been published in reference to yaws, and the present contribution by this author is perhaps the most valuable addition to the study of that disease which has appeared since the discovery of *T. pertenue*. His own conclusions are as follows:—

"1. The Philippine monkey is an excellent experimental animal, due to its high susceptibility to yaws and on account of the variety of clinical lesions that can be produced experimentally in this animal.

"2. The local lesion produced by intradermal inoculation of Philippine monkeys is a yaw clinically and anatomically identical with that produced in human volunteers experimentally.

"3. The early metastatic yaws lesions produced in Philippine monkeys by superinfection—that is, the typical metastatic yaw, the ringworm yaw, the early framboesides including psoriasis palmaris—are clinically and anatomically identical with metastatic manifestations of yaws in humans.

"4. The late yaws lesions, such as the ulcerative form, lupus-like lesions, gangosa, and the late framboesides, such as ichthyotic yaws lesions, and the keratoderma plantare as produced in monkeys by superinfection, are clinically and anatomically identical with these lesions as they occur in man.

"5. The duration of incubation of local yaw is the same in Philippine monkeys as it has been established to be in human volunteers.

"6. The incubation of the metastatic generalization of yaws produced in Philippine monkeys by superinoculation is the same as that found in human volunteers upon experimental inoculation.

"7. The duration of early yaws manifestations, as well as that of the late ones, is much shorter in Philippine monkeys than is found by clinical experience to be the case in man.

"8. However, the proportion of the duration of early yaws manifestations to the duration of late yaws manifestations is about the same in monkeys as in man.

"9. The immunity, which consists of resistance to superinfection and resistance to metastatic generalization as well as of modification of the early and late lesions that take place at the time when the resistance to superinfection starts to develop, set in with Philippine monkeys much earlier than was found to be the case in experimentally inoculated human volunteers.

"10. The fact that the period of metastatic dissemination of yaws is much more limited in monkeys than in man is due to the early onset of immunity.

" 11. The healing of existing yaws lesions, particularly the early ones, is independent of the resistance to superinfection. Yaws lesions in monkeys, as in man, may heal while the animal or the man is still susceptible to superinfection, and existing lesions will persist a long time after the stage of resistance to superinoculation has fully developed.

" 12. From this it is evident that the reinoculability of yaws animals cannot be used as a criterion for complete therapeutic sterilization of the yaws-infected body organism.

" 13. The resistance to superinfection once achieved is persistent, and no amount of treatment can cause the animal, once it has become resistant, to take infection again.

" 14. The Wassermann reaction is indefinite and ephemeral in the case of local yaws. Its strength and persistence depend upon the duration of infection, the number of yaws lesions, the intensity of the lesion and, to a lesser extent, on the number of superinoculations.

" 15. The Wassermann reaction, if it has become negative due to treatment or spontaneous healing and if all the lesions have disappeared, will reappear upon unsuccessful superinfection or reinoculation with viable material.

" 16. The serologic reactivity of the body organism to superinfection (that is, the reappearance of the Wassermann reaction and the reactivity of the organism to treatment, which manifests itself as a disappearance of the Wassermann reaction) becomes sluggish upon repeated reinoculations and treatment.

" 17. The reappearance of a positive Wassermann reaction can be produced in healed and cured animals without recurrence of yaws lesions and, therefore, a positive Wassermann reaction does not necessarily mean the existence of *Treponema pertenue* in the body organism of the animal.

" 18. The focus from which the treponemas are disseminated into the surrounding tissues, or metastatically into remote parts of the body, is the skin.

" 19. In lymph glands corresponding to the active lesions *Treponema pertenue* can be found in a fairly high percentage of cases while the early lesion is active, but *Treponema pertenue* was never found in the lymph gland when the lesion had healed, either spontaneously or due to treatment.

" 20. Spontaneous relapses do not occur in experimental monkeys when they reach the stage of resistance. The temporary stay of *Treponema pertenue* in the regional lymph gland indicates the route through which generalization in yaws takes place, but it has no significance with regard to possible relapses after a period of latency.

" 21. The latency in yaws followed by relapse depends upon the time relation between the healing of the existing yaws lesions and the incubation period of the metastatic yaws."

Everyone interested in yaws must read this paper and re-study clinical yaws in the light of some new ideas therein expressed. A good many points still remain to be solved and it is to be hoped Schöbl will continue his investigations.

H. S. S.

PASQUAL (J. Hylton). **Goundou and Yaws.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1928. June 30. Vol. 22. No. 1. pp. 59–60.

The author reports a case of goundou in a boy aged 4 years of the Berum tribe on the Bauchi Plateau, Nigeria. There was no history of syphilis or of yaws in the patient or other members of the family, and the district is said to be yaws-free. No W.R. possible. The symmetrical paranasal swellings were the size of African hens' eggs and typical. The past history in this case includes the assertion on the part of the mother that there was a swelling about the size of a pea noticed on the bridge of the nose by the parents at birth, and that there was a discharge from the nose soon

after birth which was, however, at no time sanguineous. [This statement is accepted by the author as evidence that goundou may be congenital, whereas this case and the original case figured by MANSON are the only two, I believe, in which the congenital lesion has been considered, and both rest merely upon the description given by a native parent.]

H. S. S.

NIGERIA ANNUAL MEDICAL & SANITARY REPORT, 1927. Appendix G. **Reports on Interesting Cases by Medical Officers. Some Affections of the Hands due to Yaws** [ADCOCK (E. W.)] pp. 115–116; **Report on Cases of Climatic Bubo treated by Protein-Shock** [HALL (R. N.)] pp. 117–118; **Notes on a Case of Goundou** [CRAWFORD (E. J.)] p. 120. With 4 figs. on 1 plate.

(*a*) A note drawing attention to the frequency with which a condition resembling Dupuytren's contraction is met with among natives of Benin City. This condition is commonly found in its severer forms among those who follow the trades of masons, bricklayers and carpenters, is produced by a chronic thickening of the skin spreading to the flexor tendons, and is considered to have a framboesial etiology. Yaws is said to be a common complaint in this part of Nigeria.

(*b*) Three cases diagnosed as climatic bubo and treated by protein shock [intravenous injection of T.A.B. vaccine, the method first adopted by HANSCHELL] are here reported.

(*c*) A case of goundou, the paranasal tumours being of considerable size and associated with ostitis of the mandible. [This case resembles some of those recorded by BOTREAU-ROUSSEL. The question of etiology is not mentioned.]

H. S. S.

CARROLL (R. L.). **Report of a Case diagnosed as Goundou.**—*Sixteenth Ann. Rep. Med. Dept. United Fruit Company, Boston, Mass.* 1927. pp. 165–167. With 1 text fig. [Almirante Hosp., Panama.

A note of the case of a Jamaican negro aged 46 years, seen in Panama presenting a left paranasal tumour with the characteristics of goundou. The bony hard tumour was 3·5 cm. long and 2·5 cm. wide involving the nasal process of the superior maxilla and almost occluded the left nasal passages. His blood gave a positive Meinicke's test for syphilis but he showed no syphilitic [nor presumably framboesial] lesions. Antisyphilitic treatment had no effect, but he gave a history of injury by a piece of wood to the left side of the nose 4 years before and of a nasal discharge which had commenced before the trauma and persisted for 3 months afterwards. The patient stated that he had seen three other cases similar to his own in Jamaica.

H. S. S.

KADANER (M.). Un cas de nodosités juxta-articulaires chez un blanc. [**Case of J.A.N. in a White.**]—*Ann. Soc. Belge de Méd. Trop.* 1928. June. Vol. 8. No. 1. pp. 57–58. With 1 text fig.

Reports the case of a Portuguese stone-mason aged 29 met with in the Belgian Congo where he had resided for three years, presenting typical J.A.N. on the posterior border of each ulna close to the elbow; these had first been noticed ten months previously. There was also a fibrous bursitis of the right prepatellar bursa due to his work. Previously he had lived for some years in Brazil. There was no history and no evidence of syphilis or yaws.

H. S. S.

Aramaki (Y.). Ein Fall von Nodosités juxta-articulaires (Jeanselme), beobachtet bei einem Japaner. [**J.A.N. in a Japanese.**]—*Japanese Jl. Dermat. & Urol.* 1928. Aug. Vol. 28. No. 8. German summary p. 58. [In Japanese pp. 816–824. 42 refs.] [Dermat. Clinic, Imperial Univ., Sendai, Japan.]

There are very few references to this condition in Japanese literature. Takasaki (1924) described 14 cases among natives of Palau Island; Tokuoka (1911) a case in Ryojun (Port Arthur), a man who had been in Formosa; Steiner two Japanese in Java. No cases have been seen in Japanese who had never left their own country. This is true of the case now described—a merchant aged 43 living in Hokkaido, one of the north-east islands of Japan, admitted to hospital for tuberculosis of the bladder. He had noticed for 10 years hard moveable subcutaneous nodules at both elbows and more recently in connexion with the tendo achillis of each side. These resembled clinically and histologically J.A.N., but there was no history of syphilis or yaws and the W.R. was negative. He had visited southern China and Formosa.

H. S. S.

Martin (Hans). Ein Beitrag zur Frage der juxtaartikulären Knotenbildungen bei Syphilis. [**Juxta-Articular Nodules in Syphilis.**]—*Dermat. Ztschr.* 1928. July. Vol. 54. No. 1. pp. 26–32. [8 refs.]

The author records the case of a male aged 32 who in 1916 developed a penile sore in Roumania, which healed with local treatment and no other signs or symptoms. He married in 1921—wife and child clinically and serologically healthy at time of examination in 1927, when the man showed 4 or 5 nodes the size of a hazel nut to a walnut about the right ankle; these were tender, moveable and discrete, the skin over them was normal. W.R. negative and no signs of any other disease.

Under treatment with salvarsan they underwent rapid retrogression to size of peas. In the discussion of this case the author refers to the other similar cases which has been recorded outside the tropics and which have all been noticed in this *Bulletin*.

H. S. S.

Jahnel (F.) & Lange (J.). Syphilis und Framboesie im Lichte neuerer experimenteller Untersuchungen. [**Syphilis and Yaws in the Light of Recent Experimental Work.**]—*Klin. Woch.* 1928. Nov. 4. Vol. 7. No. 45. pp. 2133–2140. [30 refs.] [German Research Inst. for Psychiatry, Munich.]

In a very interesting survey of the present position regarding the relationship of yaws and syphilis the authors pass in review practically all the evidence bearing on this fascinating problem and, most important of all, they subject it to careful criticism showing how untrustworthy are many observations, how wrong are many interpretations put on results, how misleading are many descriptions, and how many may be the pitfalls in experimental work. Yaws, it has been held, is phylogenetically older than syphilis; the distribution of yaws recedes as a higher level of culture spreads over the world. Syphilis is said by some to have reached Europe from America, but the same documentary evidence has been shown by others to prove that yaws originated among the old inhabitants of the New World. Historical material however really yields no conclusive evidence in either case. Similarly the belief that yaws was conveyed to America from West Africa by slaves is unsubstantiated. All such theories which accounted for yaws as syphilis modified by race and climate fall to the ground

when the problem receives careful study, though it is of course recognized that climate may play a part in modifying the clinical picture of yaws. All evidence at the present time goes to prove that yaws remains yaws and syphilis syphilis, but except for the typical secondary exanthem yaws cannot be differentiated from syphilis and even in this connexion it is said that a framboesiform syphilide may occur. It is only recently and in countries where syphilis is believed to be absent that many tertiary manifestations have been claimed as due to yaws.

The authors refer to their work on inoculation of cases of G.P.I. with various strains of *Treponema pertenue* and point out that because their cases were refractory to two strains from America no generalization is permissible; this would hold good even though other strains gave equally negative results as NICHOLS has shown that single strains may give different reactions in animal experiments and certainly different strains give varying effects in intratesticular rabbit-inoculations. There may be different clinical types of yaws as evidenced by descriptions of this disease emanating from different countries. All results from animal experiments must be received with great reserve; many have been invalidated, when testing artificially induced immunity, by the length of time which must be allowed to elapse before making the second inoculation and the whole question is surrounded with technical difficulties. In syphilis KOLLE showed that many strains of syphilitic virus do not exhibit any regular action in producing immunity to each other; a strain of yaws virus in the same way in rabbits does not always produce immunity to the same strain, as demonstrated by IKEGAMI, MANTEUFEL, HERZBERG. The age of the animal is also a factor as found by PEARCE and BROWN.

In man the four human experiments of LACY and SELLARDS are quoted. Four cases of yaws were treated with salvarsan. Six months later they were inoculated with yaws virus. In one a typical granuloma developed, in the others results were atypical. They were again treated with salvarsan with apparent cure and in two years' time, when free of all signs and W.R. negative, they were a second time inoculated. In the same one case as before a typical granuloma developed. It is of interest to note that this case had only had the disease three months when first treated, the other three a much longer time. Although every caution must be taken in interpreting results, the fact that in late parenchymatous neurosyphilitics non-infection occurred in 5 cases using NICHOLSON'S strain of yaws virus, 10 cases with that of PEARCE and BROWN and 10 cases with virus from Sumatra, while slight "takes" occurred in cases of disseminated sclerosis, cannot be neglected. A strain kept in animals may of course lose pathogenicity for man, but such a strain should not discriminate cases of G.P.I. Moreover inoculations of general paralytics with virus directly from a primary lesion in a disseminated sclerotic (this lesion itself induced by inoculation after one rabbit passage only) were always negative. The direct infection experiment has not been done but the authors think similar results would obtain. These experiments with G.P.I. cannot be taken to support the idea of a unity of virus but perhaps only a group reaction. The authors believe that the facts as known up to date would best be explained by postulating a group of viruses with characteristic yaws at one pole and characteristic syphilis at the other, tropical or indigenous native syphilis and some variety of framboesia being some of the intermediate forms.

H. S. S.

HUDSON (Ellis H.). **Treponematosis among the Bedouin Arabs of the Syrian Desert.**—*U.S. Nav. Med. Bull.* 1928. Oct. Vol. 26. No. 4. pp. 817–825. [27 refs.]

In an interesting paper the author gives his observations on a disease which the Arab folk call "bejel" and which they distinguish from "faranghi," the "foreign" disease or syphilis with a primary sore acquired in adult life by sexual contact. [The resemblance of the word *faranghi* to *parangi*, the term applied to yaws in Ceylon, is worthy of note.]

Bejel is not considered a venereal disease, there is no history of primary sore, everyone admits having had the disease in childhood and no one expects to get it a second time; cases are not isolated and it is said that inoculation of the children is sometimes practised. The symptoms are catarrh of nose and throat with copious discharge, voice thick, reddening of the tonsils, palate and pharynx, and may be mucous patches on the palate and about the genitals. The skin eruptions are papular, macular or circinate in character and there is a generalized adenopathy, all the superficial glands in the body being felt, hard, shotty and discrete. Later ulcers appear on the tonsils, palate, with ulcerating masses in the nose, ulcers on the limbs, and multiform skin eruptions. Later still a condition resembling gangosa is common and enlargement of the liver is generally present. There may be alopecia of scalp or beard, keratosis of the soles of the feet, ichthyotic shins and gummatous bone lesions. The Kahn test is positive; the lesions react to antisyphilitic remedies. There are no signs of the inherited disease. Tabes and G.P.I. do not occur. Having thus described the disease the author, unlike his French and Syrian colleagues, who universally regard the disease as syphilis, prefers, as others have done in the West Indies, to speak only of a treponematosis and make no exact diagnosis. He says "Bejel is presented as a spirochaetal disease due to *Treponema pallidum*, a variant of the "syphilis-yaws" treponematosis. [Such a clinical picture is not unknown among other indigenous native populations and to take refuge in some such expression as above mentioned seems to the reviewer unwarranted when a simpler explanation is to hand. The description of the disease is that of syphilis as a pandemic disease contracted in childhood, the primary lesion passing not unnoticed but unnoted in a lowly living population among whom sores and ulcers are disregarded. Syphilis under such conditions may almost be regarded as one of the exanthemata of childhood. Following the marked dermal reaction, a considerable degree of immunity results and neuro-parenchymatous syphilitic lesions do not develop. The symptoms described are all typically those of acquired syphilis as seen in children; they have puzzled observers before who, with the inherited disease in their minds when viewing children patients, have found none of the well known stigmata. Yaws, in the absence of cases showing the typical secondary efflorescence, does not enter into the problem.]

H. S. S.

BUTLER (C. S.). **Primitive Syphilis.**—*U.S. Nav. Med. Bull.* 1928. July. Vol. 26. No. 3. pp. 553–557. With 2 figs. on 1 plate.

The author is one of those who sees in yaws a kind of primitive syphilis. History, he believes, shows that syphilis was not a disease

imported from America but, on the other hand, Europe having syphilized the coastal regions of Africa then sent this untreated syphilis over in slave ships to the New World under the name of "yaws." He believes that his clinical work in Haiti confirms his view that yaws is syphilis and refers to various papers published by himself [already summarized in this *Bulletin*]. H. S. S.

CARMAN (J. A.). **Bismuth in Yaws and Syphilis : a Report upon a Series of Cases controlled by Serological Tests.**—*Kenya & East African Med. Jl.* 1928. Sept. & Oct. Vol. 5. Nos. 6 & 7. pp. 186–194 ; 219–240. [27 refs.]

The author gives an account of the introduction of bismuth into East Africa for the treatment of yaws and syphilis and discusses the factors which in these countries have to be considered in selecting a method of treatment to be used on a large scale.

He records a number of small series (17–60) of cases of syphilis and yaws treated with various preparations of bismuth, using the Wasserman and Sigma reactions as evidence of efficiency of the treatment. His conclusions are as follow :—

" 1. That yaws and syphilis are distinct diseases and although natives suffering from syphilis are often less seriously affected thereby than are Europeans they are not necessarily more easily cured on that account.

" 2. That none of the bismuth preparations discussed can be said to take the place of the synthetic arsenicals in African yaws and syphilis, in spite of early optimistic reports on their efficacy. That after twelve injections of any of the three drugs [potassium sodium bismuth tartrate, precipitated metallic bismuth, sodium tetrabismuth tartrate] a large percentage of cases are left with positive serum reactions and that even novarsenobillon must be given more frequently than has been the custom if permanent cures are aimed at.

" 3. That potassium-sodium-bismuth tartrate and tetrabismuth tartrate cannot be relied upon to have a definite chemical composition, in consequence of which fact they are apt to give rise to severe local symptoms and that this tendency constitutes a second serious drawback to their use, particularly in outpatient work.

" 4. Reduction in serum reactions may be expected to go on after treatment with precipitated metallic bismuth has stopped.

" 5. Of the three drugs the most active is tetrabismuth tartrate but the one most to be recommended is metallic bismuth for its painlessness and sustained action.

" 6. That it is not desirable for metallic bismuth to be administered by African dressers unless they are supervised."

[The use of bismuth preparations in the treatment of yaws was a natural corollary to its use in the treatment of syphilis in this country, but while in this country in the case of syphilis it was soon shown that their proper place was as an adjunct to the arsenicals or in special cases under special conditions, in our East African colonies owing to their good initial action and cheapness they were used to the exclusion of the arsenicals in the big anti-yaws campaigns that have there been started. These campaigns where mass treatment was aimed at were of the nature of uncontrolled experiments working on anything but a well established basis as previously pointed out in this *Bulletin*. The results in the present paper, though they deal with very small numbers, are therefore important in regard to yaws. That the results, in regard to syphilis, would be bad is only what might have been anticipated in the light of knowledge accumulated in this country.] H. S. S.

Langer (Erich). Die Nebenerscheinungen bei der Wismutbehandlung der Syphilis. [**Side Effects of the Bismuth Treatment of Syphilis.**] —*Klin. Woch.* 1928. Mar. 18. Vol. 7. No. 12. pp. 554–559. [Summary appears also in *Bulletin of Hygiene.*]

This very long paper, which will not bear condensation within the limits which are practicable in this journal, is worthy of study in the original as a fairly complete summary of the toxic effects of bismuth observed by a large number of workers. Besides the well-known effects on mouth, kidneys and colon, all of them generally milder than from mercurial treatment, are some skin disturbances. Perhaps the most important to remember are the general lassitude and the articular pains which occur in some cases. The author mentions also the local (buttock) skin necrosis, in patches, odd cases of which have been reported by a few workers and believed to be due to accidental entry of the remedy into an arterial twig. The author finds that the toxic effects of bismuth are generally less frequent and milder than those from mercury or salvarsan.

L. W. Harrison.

Parsons (R. P.). **Spinal Fluid in Tropical Syphilis.**—*U.S. Nav. Med. Bull.* 1928. Oct. Vol. 26. No. 4. pp. 916–922.

In trying to explain the absence of tabes and general paralysis among the Haitian population where, says the author, " syphilis is perhaps more prevalent than in any other country in the world," the theory that it was due to non-treatment is untenable ; during the last five years much treatment has been given but no cases of tabes or G.P.I. have appeared. Again to quote the author : Non-occurrence of neurosyphilis [the author in using this term does not explain whether he refers only to tabes and G.P.I. or means to include any syphilitic affection of nervous tissue,] cannot, he thinks, be explained " on a racial immunity basis brought about by many generations of yaws infections, since there is no racial difference between the town and rural native, and yet the town person contracts the venereal form and the mountain person the non-venereal form of the disease." The theory that the " Haitian strain " of spirochaete is non-neurotropic is untenable as visitors contracting syphilis in Haiti often develop paresis.

" It has been held that lesions of the central nervous system do not exist in Haiti because the Haitian disease is yaws and not syphilis. But the disease, as found in the cities, does not differ in any way (except for the absence of tabes and paresis) from the syphilis of the United States, and *our accumulation of autopsy and clinical records now shows that the rural non-venereal form of the disease known as yaws is capable of producing in Haitians all the lesions that syphilis can produce, including those that the text books attribute to syphilis only.*" (The italics are the reviewer's).

The author believes, therefore, that " at present the most logical explanation of the non-appearance of tabes and paresis in Haiti, where syphilis is universal, lies in the fact that malaria is also universal in that country."

In order to try and find support for this contention (A) " a group of 33 cases of typical yaws ranging in duration from one month to thirty years was examined " and (B) " a group of 30 typical city syphilitic cases ranging in duration from two months to thirty years was examined for comparison." Ages in A were 5–43 years, in B 21–69 years. Three of A group denied malaria and blood smears were

negative but 36 per cent. of the total were positive. In all B group there was a history of chills and fever and 18 per cent. had positive bloods (single smear examination) for malarial parasites. Among A group 2 had headaches, 1 was deaf ; among B group there were 1 case flaccid paraplegia, 1 spastic paraplegia, 1 ataxia of lower extremities without other signs of tabes, 1 deaf, 1 suffered from pains characteristic of a neuritis and 1 was a hemiplegic. Except the hemiplegic none of these cases gave positive spinal fluid W.R., though three others among group B did so without neurological symptom ; all group A gave negative spinal fluid W.R.

[It should be pointed out that the three cases in Group B giving positive W.R. are shown in the tables as suffering from (*a*) chancre, (*b*) aortitis, (*c*) chancre scar. The first and second cases are certainly odd ones in which to get positive W.R. In the table of the yaws cases the lesions on which the diagnosis was made were : " papular rash," " condylomata," " ulcers," " deaf," " pustules," " periostitis," " crab," " palmar and plantar extremities," " primary on lip." In not a single case is the characteristic secondary efflorescence remarked and to the reader the list given above is perhaps more suggestive of syphilis than yaws. The whole of the evidence as presented in this paper is unconvincing.]

H. S. S.

Gasser (R. R.). **A Comparative Study of the Meinicke Turbidity and the Kahn Precipitation Reactions in Syphilis and Allied Diseases of the Tropics.**—*Amer. Jl. Syph.* 1928. July. Vol. 12. No. 3. pp. 403–410. [U.S. Navy Med. School, Washington, D.C.]

The author's conclusions are as follows :—

" In this series the Kahn reaction is shown to be from one- to three-plus more sensitive than the Meinicke, as shown by positive results and the effect of treatment.

" The Kahn technic is not difficult for one qualified to do such a test.

" The Kahn reaction is adapted to all kinds of serum, while for the Meinicke the serum must be fresh and clear.

" The Kahn antigen mixture is more stable than the Meinicke antigen mixture.

" The Kahn antigen is standardized. The instructions for the manufacture and standardization are published. Uniform and standard antigen can be made by any reliable person.

" Test for test the Kahn is much cheaper.

" A complete routine Kahn can be completed in an hour while the Meinicke requires from ten to fifteen hours. The time element is not important but very convenient.

" The Kahn offers a quantitative test which the Meinicke does not.

" The precipitation test requires the use of no animals, employs only simple equipment, is applicable to all serum free from particles, and is not expensive ; there is only one standard technic, standard antigen may be prepared if published methods are followed. Its degree of specificity, sensitivity, reliability and adaptability commends it in the serum diagnosis of syphilis and allied diseases of the tropics."

H. S. S.

Bharadwaj (A. C.). Late Manifestations of Syphilis without a History of Primary Sore.—*Indian Med. Gaz.* 1928. Oct. Vol. 63. No. 10. pp. 566–568.

GRANULOMA VENEREUM.

Campbell (Meredith F.). **Etiology of Granuloma Inguinale, with Report of Eighteen Cases.**— *Venereal Dis. Information.* 1928. Mar. 20. Vol. 9. No. 3. pp. 93–99. [14 refs.] [Bellevue Hosp., New York.] [Summary appears also in *Bulletin of Hygiene.*]

The author contests the view of McIntosh that granuloma inguinale is due to Donovan bodies [see this *Bulletin,* Vol. 24, p. 314]. McIntosh had reproduced granuloma inguinale in man by transplantation of tissue from an active lesion and had found Donovan bodies in the new lesions. Campbell objects that in the transplanted tissue there might easily have been other organisms, and Koch's postulates were not fulfilled. Campbell cultivated Donovan bodies in Sabouraud's medium (4 per cent. maltose peptone agar), and after obtaining negative results from inoculation of guineapigs, rabbits and a monkey, he inoculated three persons, including himself. The results were also negative. The treatment which was found most successful was intravenous injection of 1 per cent. tartar emetic in doses ranging from 2 cc. increasing by 1 cc. per injection to 10 cc. every other day.

L. W. Harrison.

McIntosh (J. A.). **The Donovan Body of Granuloma Inguinale.**— *Southern Med. Jl.* 1928. June. Vol. 21. No. 6. pp. 434–438. With 4 text figs. [7 refs.] [Univ. of Tennessee College of Med., Memphis, Tenn.]

The author continues his observations on this condition, a subject upon which he read a first paper before the Southern Medical Association in 1927. The following experiment was made from which it is concluded that (1) the Donovan body is the cause of G.I.; (2) it is constantly present in characteristic lesions; (3) the incubation period is about 40 days; (4) there is no filterable virus concerned; (5) in making inoculations of tissue from a case of the disease into a healthy individual acute necrosis results from the action of associated organisms injected at the same time; (6) tartar emetic is curative and acts by stimulating a large mononuclear leucocytosis.

Granulations obtained from a spontaneous case were ground to pulp in saline; this was then centrifuged to remove heavier tissue particles. The supernatant fluid, which was shown to contain numerous Donovan bodies, was then divided into equal parts. One part was filtered through a Berkefeld filter and 2 cc. injected into the left posterior axillary fold of a volunteer while 2 cc. of non-filtered suspension were injected in the right fold. The injection on the left side gave rise to no lesion during ensuing 87 days. The injection on the right side was followed by necrosis in two days with extrusion of the core on the fifth day and formation of a purulent ulcer, which however healed a week later. In 41 days from the original injection induration at the site of the healed ulcer was noted from which by aspiration typical

phagocytized Donovan bodies were obtained. The indurated area then broke down into a typical G.I. and progressed until treatment was begun 87 days after the inoculation.

H. S. Stannus.

WILLMOTT (C. Brooks). **Ulcerating and Sclerosing Granuloma: So-called Granuloma Inguinale, with Case Reports.**—*Southern Med. Jl.* 1928. Oct. Vol. 21. No. 10. pp. 872–875.

While reporting 4 cases of granuloma inguinale the author points out how necessary it is to bear this disease in mind if a correct diagnosis is to be made in every case. In treatment antimony thioglycollamid gave uncertain results and he is disappointed to find that tartar emetic which "continued for several weeks was supposed to be a specific," did not give good results. [British physicians have long recognized that treatment by antimony must in many cases be persisted with for many months.] Exposure to X-ray before treatment he thinks is useful and in many surgical intervention and cauterization are considered warranted. One of the author's cases was treated with mercurochrome. Vaccine treatment as recommended by GOLDZIEHER and PECK of New York is alluded to but was not given a trial.

H. S. S.

DE VOGEL (W. T.). La lutte contre le *Granuloma venereum* dans la tribu des Marandinois (Nouvelle-Guinée hollandaise). [**Measures against Granuloma Venereum in Dutch New Guinea.**]—*Bull. Soc. Path. Exot.* 1928. May 9. Vol. 21. No. 5. pp. 354–363.

An interesting report upon granuloma venereum in Dutch New Guinea where in the southern region the disease in epidemic form threatened the extinction of the Marindinois population. Following the call for help from Father VERTENTEN of the Catholic Mission, Doctors SITANALA, CNOPIUS and THIERFELDER undertook the work of organizing a campaign against this scourge. The disease was very widespread, affecting 12–15 per cent. of the population; in only a single case was spontaneous cure believed to have occurred. Any part of the body may be affected and extra-genital conditions were considered much more refractory to treatment. Spread by lymphatic channels is commonly seen, but in 38 cases generalization by the blood stream had taken place. In a single case visceral infection occurred. The pus in a liver abscess which THIERFELDER operated upon contained pure Calymmobacterium granulomatis. Long contact is considered necessary before infection occurs; the incubation period is about 2 weeks. In most cases death occurs from intercurrent disease following a cachexia produced by the disease. The disease appears to have been endemic for a very long time, but rapid spread only appears to have occurred since greater intercommunication between villages became possible as the result of the suppression of head-hunting and inter-tribal war. Once started, owing to the loose habits of the population, including wife prostitution, the disease was rapidly diffused. The campaign against the disease consisted in treatment by tartar emetic, and a complete revision of native marriage customs and housing habits.

H. S. S.

THIERFELDER (M. U.). **The Control of Granuloma Venereum among the Marindinese in Dutch South-New-Guinea.**—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië.* 1928. Vol. 17. Pt. 2. pp. 393–423. With 10 figs. on 7 plates & 4 maps.

In this *Bulletin*, Vol. 25, p. 668, there appeared a summary of a paper by DE VOGEL upon the subject now dealt with by Professor Thierfelder in greater detail. The author gives an interesting ethnological survey of the people among whom he was working to show the part native custom may play in the propagation of a disease and the method of carrying out the campaign against G.V. is fully dealt with. The essential points have, however, been covered in the previous summary.

H. S. S.

GULDBERG (Gustav). Lymfadenitis ingvinalis granulomatosa subacuta. (Lymfogranulomatosis ingvinalis subacuta benigna—Nicolas og Favres sykdom). [**Granuloma Inguinale.**]—*Norsk. Mag. f. Laegevidenskapen.* 1928. Aug. Vol. 89. No. 8. pp. 762–775. [26 refs.] [German summary p. 776.]

The author reports a typical case of granuloma inguinale in a 26 year old seaman, who 14 days before the development of the bubo, showed a small spontaneously healing lesion of the glans. The case was treated in the Oslo hospital and is discussed at length with pathological findings for the benefit of his Norwegian colleagues.

H. S. Stannus.

CLIMATIC BUBO.

Araujo (Oscar da Silva). O azul de methylenio na lymphogranulomatose inguinal subaguda. [**Methylene-Blue in the Treatment of Subacute Inguinal Lymphogranulomatosis.**]—*Ann. Brasileiros Dermat. e Syph.* 1928. Jan.–Mar. Vol. 4. No. 1. pp. 16–20.

The first patient, a man of 27 years, had had a swelling of the glands of the left groin for 6 months. When seen at the end of that time the mass was discharging by several sinuses. W.R. negative. There was no constitutional disturbance then, but history of previous headache, loss of appetite, general malaise, and rheumatic pains. At first " 914 " was given without any benefit. Potassium iodide to the limit of tolerance was also ineffectual. Intravenous injection of methylene-blue, 5–10 cgm. daily in 1 per cent. solution, was followed by marked improvement in a fortnight, and the patient went away cured in a month. There was no general reaction and there had been no relapse when the patient was seen later [how long after is not stated].

A second, very refractory, case of old-standing, after a little improvement did not clear up further, though the initial 5 cgm. daily dose was increased to 10 and later to 15 cgm.

A third reacted strongly—shivering, rise of temperature, articular pains and severe prostration—to the first dose of 5 cgm. The dose was, therefore, reduced to half and then rapidly increased till 10 cgm. were given for a month without disturbance. Improvement set in, as in the first case, after a fortnight and he was cured by the end of the month. This last patient had also an application of iodine, in the form of iodex, locally rubbed in.

H. Harold Scott.

Hillsman (John A.). Wilshusen (H. F.) & Zimmerman (H. M.). **Lymphogranulomatosis inguinalis. Report of a Case of Twenty Months' Duration, with Autopsy Observations.**—*Arch. Dermat. & Syph.* 1928. Sept. Vol. 18. No. 3. pp. 383–392. With 7 figs. [21 refs.] [New Haven Hosp. & School of Med., Yale Univ., New Haven, Conn.]

The report of a case, unsuccessfully treated, of what in the absence of a more positive etiology is considered to be climatic bubo or lymphogranulomatosis inguinalis with pathological findings.

H. S. S.

Wilmoth (Clifford Lee). **Subacute Inguinal Lymphogranulomatosis. Report of Thirty Cases.**—*Jl. Trop. Med. & Hyg.* 1928. July 2. Vol. 31. No. 13. pp. 153–156. With 1 text fig. [8 refs.]

This paper is practically a recapitulation of one appearing in an American periodical summarized in this *Bulletin*, Vol. 25, p. 665.

H. S. S.

SLEEPING SICKNESS.

League of Nations. Health Organisation. **Report of the Second International Conference on Sleeping Sickness.** C.563. 6 pp. 1928. Nov. 21. Geneva.

This Conference was held in Paris from November 5th to 7th, 1928, to consider the final report of the International Sleeping Sickness Commission and questions arising therefrom. Delegations from Belgium, France, Great Britain, Italy, Portugal and Spain attended. Two Sub-commissions were formed, one to deal with administrative measures and the other with research. The Conference did not recommend at present the creation of another International Commission of Research, but it elaborated a programme of further research and investigation which, in its opinion, should be carried out in the different national laboratories in countries in which diseases transmitted by tsetses prevail. The programme is as follows:—

A. Research.

"The Conference recommended that a further study be carried out in different national laboratories of countries in which diseases transmitted by tsetse flies prevail on the problems enumerated below:

"1. The questions of natural immunity, spontaneous cure, and of acquired immunity of man should be further studied. For this purpose, the experimental infection of volunteers would be of value. Experiments on ruminants that are relatively resistant are also recommended; these, after recovery, should be exposed to the bites of tsetse flies.

"2. The question of the natural immunity of Cynocephalus and of Cercocebus (mangabeys) should be followed up. An attempt should be made to overcome this immunity and to establish its relationship with the serum-resistance of trypanosomes. This would throw light on the possibility of man becoming infected with animal trypanosomiasis.

"3. The natural reservoir of *T. gambiense* appears to be limited to man, but it is still necessary to look for other reservoirs. Such an investigation should be directed towards the discovery of new means of diagnosis. The Conference directs special attention to the observations made by Dr. Peruzzi relating to the presence of trypanosomes in serous cavities.

"4. The question of the origin of *T. rhodesiense* and, in particular, its relationship to *T. gambiense* and *T. brucei* has not yet been settled and calls for further investigation.

"5. Are all the characteristics acquired by trypanosomes preserved during their cyclic evolution in the body of the tsetse (resistance to therapeutic remedies, exalted virulence, high transmissibility index, etc.)?

"6. The evolution of different polymorphic trypanosomes in the body of the tsetse, chiefly those which naturally infect domestic animals and game in areas in which *G. morsitans* is prevalent. Investigation of the factors of environment, climatic or other, on the cyclic transmissibility and pathogenicity of polymorphic trypanosomes by glossinae.

"7. Anatomopathological investigations.—It would be of the greatest interest to verify in man the anatomopathological findings of Peruzzi in monkeys, chiefly in so far as lesions of the myocardium, of the brain and of the serous membranes are concerned. The comparative pathological anatomy of trypanosomiasis of cattle and wild animals should be carried out at the same time. For this investigation, use should be made of monkeys, animals suitable for this purpose.

"8. Biological studies of tsetse flies should be carried out concurrently with epidemiological and epizootic investigations, and each should be carried out, preferably by specialists, on similar lines in *T. rhodesiense*, *T. gambiense* and *T. brucei* areas respectively.

" 9. The most important factor in determining the infectivity of a trypanosome being its faculty of cyclic transmission, its evolution should be followed in individual subjects throughout the course of their infection. It should be determined whether the infectivity is liable to increase, decrease or disappear altogether ; whether the cyclic transmissibility may, after a latent period, develop anew in chronic cases, and under what conditions it may disappear altogether. A knowledge of such conditions might lead to an effective method of prevention.

" 10. A study of the nature of the blood ingested by tsetse flies in game areas where *G. morsitans* prevails should be pursued with the object of ascertaining the rôle of animals in the biology of glossinae, with special attention to such animals as may act as reservoirs of the virus. For this purpose the morphological examination of the ingested blood, supplemented where necessary by the precipitin or some similar test, might be employed. It is important, therefore, to study the relative value of such tests and the conditions which limit their applicability.

" The part played by the hippopotamus as a reservoir of the virus calls for further study ; this can best be done by the experimental infection of young animals with infected flies.

" 11. Morphological studies should be extended to all members of the polymorphic trypanosome group, more especially to trypanosomes of the type *brucei* where *palpalis* prevails and to trypanosomes of the *pecaudi* type in *palpalis, longipalpis, tachinoides* and *morsitans* regions.

" 12. Therapeutic researches are of the highest importance. Chemiotherapy is at the present time the soundest basis for preventive measures in the central regions of tropical Africa. Investigations into the curative effects of tryparsamide, tryponarsyl Fourneau 270, etc., should be continued. It is to be hoped that other still more effective, and at the same time cheaper, substances may be discovered, and, *if possible, substances which would be effective when administered by mouth.* Moranyl (Bayer 205 or Fourneau 309) would appear to be in a separate category in that they afford protection over a long period ; they should be employed for the protection of healthy individuals, at the same time as the sterilisation of the blood of patients is being carried out by the judicious use of atoxyl or of the other remedies mentioned above.

B. Co-ordination of Trypanosomiasis Investigations.

" The Conference considered that the Health Organisation of the League of Nations might render useful service by keeping the workers in the different national laboratories in touch with one another, for which purpose the following recommendations are made :

" 1. Laboratories and research centres in Africa which are engaged in research work on trypanosomiases might find it useful to communicate to a small expert committee appointed by the Health Organisation for the purpose, say once a year, an account of the work done, together with publications. This Committee would in its turn from time to time circulate, and where necessary translate, the collected papers with a short general review of the progress made in trypanosomiasis research and prevention, to the institutes and centres referred to, as well as to interested administrations.

" 2. To encourage the co-operation of the different institutes in such a scheme, the Committee referred to might be empowered to make recommendations to the Health Committee, say once a year, for the award to one or other of these institutes of a *bourse individuelle*, which would enable a member of its staff to visit some other country or countries where work of special interest to the laboratory selected is being carried out.

" 3. In view of the considerable differences that characterise the trypanosomiases in different localities, the Conference recommended individual " interchanges," which would enable research workers in African laboratories to become acquainted with trypanosomiases investigations being carried out in other laboratories."

The Conference also considered the general recommendations for the control of sleeping sickness in African Dependencies contained in the Final Report of the International Commission on sleeping sickness (this *Bulletin*, Vol. 25, p. 781), and recommended their adoption in the following form :—

" Among the measures which may be recommended to Governments for application in the light of local circumstances and where measures of strict control are necessary or possible, it is agreed to propose the following :

" (*i*) Control over the movement of natives. This implies :

" (*a*) Enumeration of natives, carried out by the administrative authorities ;

" (*b*) Adoption of an identity book, card, etc., for each native, containing particulars as to health, which could serve as a medical passport ;

" (*c*) Delimitation of areas, for entry into and departure from which a medical authorisation will be obligatory ;

" (*d*) Close co-operation between medical and administrative authorities—without which any prophylactic measures would be ineffective—and in special cases the conferment of police powers on medical officers ;

" (*e*) The establishment of observation posts for medical examination and medical control of natives.

" (ii) Control and treatment of infected natives, both of which should be as complete as possible ; to ensure this, there are required :

" (*a*) An adequate medical personnel ;

" (*b*) Powers to enforce the medical examination and treatment of natives ;

" (*c*) In case of necessity, the power of withdrawal of the medical authorisation at travel.

" (iii) Clearings, effectively maintained, at watering-places, around villages and at river crossings.

" (iv) When the local administration considers this measure indispensable, the evacuation of heavily infected zones and the establishment of the population in a more favourable situation in the vicinity."

A Draft International Agreement for the campaign against sleeping sickness was presented by the Belgian delegation ; this is given in an Appendix to the Report. The Conference considered that a general agreement between the States would be difficult to achieve at present in view of varying local conditions.

The Conference also considered that the Health Organisation of the League of Nations could usefully add to the service it has already rendered by collecting and analysing the facts obtainable in regard to the incidence of human trypanosomiasis, its relative importance in relation to other causes of morbidity, and the results of the different measures, medical and administrative, which are taken to combat the disease in different parts of Africa.

W. Yorke.

Carpenter (G. D. Hale). **Annual Report on Sleeping Sickness for 1927.**—*Uganda Protectorate Ann. Med. & San. Rep. for Year ended 31st December*, 1927. Appendix No. II. pp. 66–75.

An account is given of the present state of affairs in each of the proclaimed sleeping sickness areas.

Victoria Nyanza Area. Control of this area has been greatly facilitated by arrangements under which an Assistant District Commissioner in the Entebbe, Masaka, and Mengo districts is charged primarily with the control of sleeping sickness in his part of the area. Later, an

Assistant District Commissioner was appointed in the Eastern Province for the control of all the sleeping sickness areas in the Province.

Apart from an outbreak of sleeping sickness at the head of Murchison Bay, there has been an orderly progress of reclamation in the Mengo district, which has been quite ideal in its procedure. The District Commissioner on receiving applications from natives to be allowed to return to certain places has first considered whether it is administratively desirable and whether there are enough applicants to form a strong colony. The Inspector then examined the area and furnished a report from which it was then possible to give a decision.

In Busoga there has been no development of the coast land, except for the exploitation of two large forestry concessions. At Jinja steady progress has been made with reclamation of Kerinya peninsula, which can now be considered safe, but the bank of the Nile is still very dangerous below the Owen Falls. The dispensary at Lumino has continued to treat cases of sleeping sickness not only in Uganda, but among natives from the Kenya side of the border. No case of sleeping sickness has been discovered among the inhabitants of the Sese and Buvuma Islands, and no cases have been found among the fishermen, except in the endemic area around the Mjanji.

In the previous report it was mentioned that four cases of sleeping sickness had been discovered at the head of Murchison Bay, near Port Bell; it was not then possible to decide whether the local *palpalis* were to be regarded as infected. Subsequent events, however, dispelled this doubt, and it became evident that immediate action was necessary. Recommendations were made that all wood-cutting in the area should be stopped, the irregular penetration which had been going on for several years should be checked and regularized, and all persons owning land along the lake shore should be compelled to clear their own section of the shore for one hundred yards back from the water. The whole population was repeatedly inspected, and the number of cases detected is fourteen. As a result of the action taken, it has been hoped that the local outbreak has been checked.

The state of affairs in the *Victoria Nile area* is still unknown. The *Mpologoma area* has been reported upon by Dr. van Hoof of the League of Nations Commission, as also has the *Busitema area*. The *Siroko area* has not been examined since 1925. In the *Katwe area* the portion in Toro district was toured by Carpenter in December. It was found necessary to increase the size of the proclaimed areas so as to embrace the upper parts of several rivers, which have been shown to be infested with fly. On one of them two cases of sleeping sickness had been detected by a native dispenser. No cases were found at Katwe itself, at Kasenyi, or at Katunguru. The *Wasa River area* and the *Bwamba areas* have not been re-visited. The question is under consideration whether a fishing industry can be allowed in the *Buganda Lake Albert area*. The *Bunyoro area* was not visited; the boundary requires redefining, as it includes much country that could now be safely opened for habitation, and the important Budongo forest is now probably fly-free.

As regards the *Nile area*, the part in the West Nile district shows no deaths from sleeping sickness, but it is probable that deaths are concealed. Conditions at the Railway fuel camp were unsatisfactory. The population of Junam county along the Nile was examined and seven definite cases of sleeping sickness were seen and seven other possible cases in which trypanosomes were not seen. Migrations into the West Nile district from Madi have unfortunately continued on a

somewhat large scale. Until October there was no Medical Officer in Gulu, and the author has been unable to examine the area. Returns of death from sleeping sickness were made quarterly by the chiefs, and are shown in tables. In the *Acholi area*, nearly all the deaths were recorded from Keyo, the others being in Attiak. The native returns of death from sleeping sickness in the Madi area of the Gulu district are also given in tables. The sudden rise in the cases of 1926, and early in 1927, is not reflected in the death returns, which show the efficacy of the methods adopted. There was no Medical Officer in the Chua district and Carpenter was not able to visit it. One case of sleeping sickness was discovered by the Sub-Assistant Surgeon.

The treatment of all cases has been by tryparsamide, except for a temporary shortage of the drug early in the year. This drug produces effects of a nature quickly appreciated by the natives themselves. There are several records of cases in Madi where an astonishingly good effect was produced which lasted for several months, even when there were signs of involvement of the central nervous system. W. Y.

Kopke (Ayres). Estudos executados pela missão médica em Moçambique e proposta para a ampliação do laboratório central do hospital Miguel Bombarda de Lourenço Marques transformando-o no instituto de investigação médica. [**Work of the Medical Mission in Mozambique.**]—*Jl. Soc. d. Sciências Méd. de Lisboa.* 1928. Sept. Vol. 92. 56 pp.

This long article contains much that is already well known as regards the history of sleeping sickness and the discovery of various trypanosomes, the discussions which have taken place and the views held as to the identity or otherwise of *gambiense*, *rhodesiense*, *brucei*, etc., and quotes considerably from the work done at Entebbe. The route taken and the investigations carried out by the Portuguese mission in Mozambique are described. While examining the blood for trypanosomes opportunity was taken to note also the presence of other parasites—Piroplasma, Halteridium, Leucocytozoon, Plasmodium, and filarial embryos.

In bovines trypanosomes of the *congolense* or of the *vivax* type were seen, but not both together in the same animal. In some regions tsetses were not found, but other blood-sucking flies in considerable numbers, Stomoxys, Haematopota, Tabanidae, etc.

A comprehensive scheme of work is proposed of which the following is a résumé:

1. Investigations, in the properties held by the Nasa Company, to determine foci of endemicity.
2. At the same time, to map out the distribution of the various species of Glossina and by dissection to find out the percentage infected.
3. Inoculation of animals, especially Cynocephalus, Cercopithecus, and dogs, by means of recently caught flies.
4. To take blood-smears to determine infection by various protozoal parasites, and send specimens to the central laboratory.

Questions of personnel, staff, pay and permanency of tenure are all spoken of and the establishment of concentration camps and local laboratories in endemic areas considered. A very important proposal is the collaboration between workers in human and animal trypanosomiasis. In the south of the province an intensive study is projected in those districts where animal trypanosomiasis exists in the absence, or with extreme scarcity, of tsetse flies.

In its original state, or when this article was first communicated, maps were shown. It is a pity that such were not included in the reprint in order that the route taken by the Mission might be more closely followed. H. Harold Scott.

STEUDEL. Die französische Schlafkrankheitsbekämpfung. [**The French Fight against Sleeping Sickness.**]—*Muench. Med. Woch.* 1928. Sept. 28. Vol. 75. No. 39. pp. 1684–1686.

This article is a criticism of the French attempts to deal with sleeping sickness, particularly in the Cameroons, by wholesale atoxylization of the infected. W. Y.

HÉRIVAUX. Un foyer épidémique de trypanosomiase humaine au Togo. [**An Epidemic Focus of Human Trypanosomiasis in Togoland.**]—*Ann. de Méd. et de Pharm. Colon.* 1928. Apr.–May–June. Vol. 26. No. 2. pp. 127–141. [Refs. in footnotes.]

The paper commences with a historical review of sleeping sickness in Togoland, where the disease has been known to exist since about 1850. Passing to a consideration of the epidemic sector, the author points out that the Bina river forms its axis. The author has followed its terminal course from the Dahomey village of Tchélengada situated 6 kilometres over the frontier to its confluence with the Keran, a large branch of the Koumongou. In this course of 50 kilometres, the name of the river varies with the different peoples inhabiting its banks. A description is given of the country through which it flows.

The centre of the epidemic is the Lama-Tessi, which comprises three-fourths of the cases. It is in the villages of this canton that the greatest density of the disease is found. The Lama-Tessi is one of the most important of the dozen countries into which the Cabrais country is divided. Apart from Kodjéné, it constitutes with its 17,000 inhabitants the most highly populated district; it occupies about 230 square kilometres.

A description is next given of the organization of prophylactive activities which were put in charge of LETONTURIER, when the epidemic was proclaimed in January, 1927. In the following table the result of examining 21,863 individuals is summarized :—

Sexes and Ages.	No. examined.	Suspects.	Trypanosomes (Microscopic diagnosis).	Index of disease. Percentage.
Boys under 12	4,802	1,282	164	3·41
Girls under 12	4,305	911	76	1·76
Youths between 12 and 20	1,001	327	72	7·19
Maidens between 12 and 20	341	108	13	3·81
Young men between 20 and 40	3,946	1,422	398	10·08
Young women between 20 and 40	4,151	1,091	237	5·70
Men of 40 and upwards...	1,694	356	92	5·43
Women of 40 and upwards	1,623	279	42	2·58
Total ...	21,863	5,776	1,094	

Atoxyl was the drug mainly used; tryparsamide is without doubt more efficacious in the nervous stage of the disease, but the fact that it had to be given intravenously restricted its employment. Atoxyl was given in large and frequently repeated doses. The average dose used was 90 to 95 cgm. in women, and 120 to 125 cgm. in men; seven such injections were given at intervals of 16 to 18 days. It is still too early to judge of the results.

The disease is due to *T. gambiense* and the infection is spread by *G. palpalis*. The author points out that game does not exist in Lama-Tessi, and that the inhabitants of the infected district are robust and well-nourished.

W. Y.

Fourche (J. A.). Relation sur le fonctionnement de la mission autonome de prophylaxie contre la maladie du sommeil au Kasai. [**The Work of the Prophylactic Mission against Sleeping Sickness in Kasai.**]—*Ann. Soc. Belge de Méd. Trop.* 1928. Sept. Vol. 8. No. 2. pp. 169–184.

In this paper an account is given of the work done against sleeping sickness in Kasai. The geography of the district and the characters of the inhabitants are described, and the general distribution of sleeping sickness is indicated. During 1926, 145,050 people were examined and 3,216 cases of sleeping sickness recognized; and in 1927, 235,795 were examined, and 6,432 found to be infected. The disease thus flourishes in the whole of the portion of Kasai examined; its intensity, however, is very variable, oscillating between 1 per cent. in certain zones and 10 per cent. in others; and in certain isolated places it is even greater than 10 per cent. A rough indication of the distribution of the disease in the district is given. Of the therapeutic and prophylactic results obtained, the author points out that during 1926 the 3,216 cases discovered to be infected and 7,613 doubtful cases were treated; in 1927, the 6,432 infected cases and 9,657 doubtful cases were treated.

In a table, the information obtained in the various districts during 1926 and 1927 is summarized. This table shows the number of people examined in each district, the number infected, the gross percentage of sick (new patients + old patients, whatever their state), and the ne percentage (old patients still infected + new patients): the difference gives the measure of the therapeutic results in the second and subsequent examinations. The number of doubtful cases is also recorded.

Observations were made on the prophylactic action of "Bayer 205." In 1926, one or two injections of the drug were given to 3,101 healthy persons living in heavily infected (10 per cent.) zones. Of these, 1,681 were re-visited after 7 or 10 months, and 772 were again seen after 15 months. This work is the subject of a special paper [see Fourche and Ricklin below] and the author contents himself here with merely remarking that the method is very efficient.

W. Y.

Bakunin (Louis). Rapport sur les travaux accomplis au Mayumbe par la mission medicale pour la luttee contre la maladie du sommeil dans le district du Bas-Congo. (Mai 1925–Mars 1926). [**Work done at Mayumbe, Lower Congo, of the Sleeping Sickness Mission.**]—*Arch. Ital. Sci. Med. Colon.* 1927. June. Vol. 8. No. 6. pp. 312–326.

Before giving an account of the work of the mission under his direction, the author considers it necessary to refer briefly to the history of

previous sleeping sickness work in the region of Mayumbe. In 1921 this district was divided for sleeping sickness purposes into two great zones, that of Lukula and that of Tshela. The first examination of Lukula commenced in 1920, but for various reasons the figures obtained are of little real value. Later investigations made in July, 1921, showed that of 16,302 persons examined, 5·17 per cent. had trypanosomiasis. Tshela was examined for the first time in May, 1921, and of 3,409 persons examined, 4·5 per cent. were infected, and of 2,339, who were labourers, 3 per cent. RODHAIN, in his tour of inspection the same year, examined 3,105 patients, and 4·3 per cent. were found to be infected.

Nothing was done during 1922, but between February, 1923, and March, 1924, MARUGO examined the whole population of Mayumbe, with a result that he found 7,280 cases (4,399 new and 2,881 old) amongst the 145,204 natives examined, *i.e.*, about 5 per cent. The author draws attention to the fact that, since this figure is based on a much larger population and on a much larger territory, it is much more important than the preceding figures.

Bakunin was appointed in charge of the mission in May, 1925. The constitution of the mission is stated. Its objects can be summarized as follows :—

1. Census of the population and examination of the natives from the point of view of trypanosomiasis.
2. Provision of the healthy natives with medical passports, and the replacing of those in bad condition.
3. The furnishing of the infected natives with a treatment tally and completing those of the old cases describing their treatment and the results.
4. Lumbar puncture of old patients, who had received two complete series of therapeutic injections.
5. Reorganization of the treatment centres.
6. The mission was also entrusted with the distribution to the natives of an anti-dysenteric vaccine prepared at the Leopoldville laboratory ; it is remarked that the distribution of this vaccine and its results is the subject of a report that has already been furnished.

The result of examination of the whole population is summarized in the following table :—

	Men.	Women	Boys.	Girls.	In-fants.	Total.
Examinations ...	34,821	42,601	22,875	22,312	14,616	137,225
Punctures	13,064	15,127	10,554	9,229	1,406	49,380
Trypanosomes new ...	933	1,600	747	571	9	3,860
Trypanosomes old ...	1,765	2,480	1,098	796	—	6,139
Percentage New cases	2·8	3·9	3·4	2·6	0·06	2·8
Percentage Old cases...	5	5·8	4·7	3·5	—	4·4
Percentage Total ...	7·8	9·7	8·1	6·1	0·06	7·2
Deaths	208	217	94	39	—	558= 0·4%

Lumbar punctures 2,433—normal fluid 1,813, 74 per cent.—altered fluid 620, 26 per cent.
Change of residence : 401.
Refractory, absent, or unknown : 681.

After commenting on these figures, the author reaches the conclusion that the disease is still progressing in the district. Many difficulties attend sleeping sickness work here. The villages are widely distributed

in a country which is mountainous and covered with forest. The chiefs have little authority. The distances are so great that it is impossible to keep watch on the native assistants. It is difficult to identify the natives, and, consequently, the refractory patients often escape observation. Finally, there is lack of good feeling towards the Medical Service, not only by certain chiefs, but also by some white residents. The paper ends with a list of recommendations for dealing with the situation.

W. Y.

Bakunin (Luigi). La lotta contro la malattia del sonno (trypanosomiasi) nel Congo Belga. [**The Sleeping-Sickness Campaign in the Belgian Congo.**]—*Arch. Ital. Sci. Med. Colon.* 1928. July. Vol. 9. No. 7. pp. 407–414.

This is an interesting paper though the latter part only is concerned with the subject of the title. The earlier part is a brief historical note on trypanosomiasis in general, followed by a sketch of the symptoms, diagnosis, and treatment. The rarity of the presence of the trypanosome in the spinal fluid is shown by the fact that among 2,433 individuals on whom lumbar puncture was performed the parasite was found in the fluid on three occasions only.

In the Belgian Congo there are, not counting efforts of minor importance, four medical missions doing work on a large scale, at Basse-Congo, Kuango, Equatore, and Uelé. The methods employed seem to savour too much of compulsion to find favour among British workers. Thus, the districts are "combed" for patients; "when after a long and difficult search, it is possible to lay hold of them, they are shut up in proper lazarettes and subjected to the necessary treatment and released only when cure has been attained." Every individual of any age and either sex is examined, and any found positive is immediately given an intravenous injection of the selected drug. Each district is under the charge of a Sanitary Agent, with a certain number of native assistants trained to carry out laboratory examinations for parasites and to give intravenous injections. A list of all the patients is kept, and each is injected weekly for 3 months, the course being repeated after an nterval of the same length. After a time the medical officer pays another visit, searches for fresh cases, examines those under treatment, and decides whether they may be left for six or twelve months, or are to be retained for a fresh course.

Towards the end of the paper the author makes the following remark which will find an echo in the hearts of all conscientious workers in tropical zones: "In Europe far too little is realized of the vast amount of work performed by colonial medical officers in equatorial regions in waging war against the many parasitic diseases which prevail, and in particular against trypanosomiasis."

H. Harold Scott.

Fourche (J. A.) & Ricklin (J.). Expérimentation du Bayer 205 au point de vue préventif dans la pratique itinérante. [**Prophylactic Administration of Bayer 205 in Itinerant Practice.**]—*Ann. Soc. Belge de Méd. Trop.* 1928. Sept. Vol. 8. No. 2. pp. 143–160.

In this work, the authors set themselves to ascertain whether Bayer 205 given to healthy persons residing in heavily infected

regions had any prophylactic action and, if so, what is its duration? Their procedure was as follows :—

1. Heavily infected centres were chosen.
2. The drug was given only to non-infected persons.
3. Specific treatment (atoxyl or tryparsamide) was given to infected and to doubtful cases.
4. Re-examination of the centres after a certain time and determination of the percentage of new infection among the Bayerized persons (index of contamination).
5. The Kasai, and particularly the regions of the Lulua and Dibaya provided the necessary centres of heavy infection. Their first examination, and the Bayer injections, were made between June, 1926, and May, 1927.

Details regarding the number of persons examined, the number injected, and so forth, are given in a series of tables.

At the first examination, Centre 1, M'Bawo-Tshibi, 12 to 16 per cent. were infected ; Centre 2, Tshimbalanga-Tshiniama, 15 to 23 per cent ; Centre 3, Kateba, 7·8 per cent ; Centre 4, Lukusa, 5 per cent. ; Centre 5, Tshimbulungu, 10 per cent ; Centre 6, Kamango-Kalonji Kashia, 10 to 20 per cent., and Centre 7, Kasadi-M'Baye-Kabemba, 10 per cent.

Diagnosis in the majority of cases was based on microscopical examination, but in a few—old cases—the diagnosis was clinical. All the infected and all the doubtful cases were set on one side and Bayer 205 was given only to the healthy. Furthermore, the old and debilitated, those suffering from febrile disturbances, and women who had passed the sixth month of pregnancy, were also excluded. For political reasons the authors also abstained from injecting those healthy persons who objected; these, however, were comparatively rare. The drug was given intravenously in a dose of 1 gm. to a healthy adult, and from 0·3 to 0·75 gm. to children and adolescents. A few sucklings received 0·15 to 0·2 gm. The majority of the patients were given two injections, the second being administered 15 to 30 days after the first. In the period mentioned, 5,141 [5,143 ?] injections of Bayer were given as follows: 1,059 persons had a single injection, and 2,042 had two injections. Apart from certain slight symptoms, the injections were well tolerated ; only a single death occurred, from cardiac syncope. Parallel with these, in all the centres in question, the infected received six massive injections, either 1 gm. of atoxyl, or of 2 gm. tryparsamide, spaced at intervals of not more than a week. The same treatment was also given to the doubtful cases, that is to those who had typical glands which were negative on puncture.

In the re-examinations the same technique was followed as in the first examination, except that in those who had Bayer and showed typical glands several punctures were made. In all, it was hoped to re-examine 2,185 Bayerized persons in Centres 1, 2, 3, 5 and 6. Centre 4 was excluded from the re-examination, because the initial number (5 per cent.) of infected was too small to allow of any conclusion, and Centre 7 and certain of the cases in Centres 1 and 5, because they were too recently treated with the drug. As a matter of fact, it was found possible to examine only 1,681, that is 77 per cent. of the above number, owing to the movements of the population resulting from the industrial activity of the district. These 1,681 persons re-examined comprise 429 Bayerized seven months previously, and 1,252 Bayerized ten months previously. The results of the examination are set forth in detail in a table, from which it is seen that the index of contamination

is nil amongst those who have received two injections of Bayer seven months previously. The index of contamination is very small in those Bayerized ten months previously, and it was smaller among those who had two injections than among those who had only one. As a result of this portion of their work, the authors conclude (1) that Bayer 205 given to healthy persons in one or two doses exerts a really strong preventive action against infection with *T. gambiense*, (2) that the preventive action is fully efficient for seven months after two injections, and (3) that it is marked up to ten months, especially in those who had two injections.

The authors point out, however, that the treatment of atoxyl or tryparsamide given to the infected and doubtful cases doubtless afforded protection to non-infected cases by reducing the risk of infection, and this fact must be taken into consideration in judging the effect of prophylactic administration of Bayer 205.

The next part of the work consists of a consideration of the parts played by these two factors in the protection of the population. The point could easily be settled if one could abstain from treating the sick in two areas equally infected, and give prophylactic Bayer to the healthy in one of the areas and nothing to the healthy in the other. This comparison, however, they were unable to make, and the authors had to content themselves with contrasting the results obtained in the Bayerized healthy with the untreated healthy in districts in which the sick and the doubtful had been treated with arsenicals. The number of healthy not Bayerized was small, except in the Tshimbalanga centre, and the Kateba group and at Mwamba Gufulu. The number of infected found in these three places at the first examination was respectively 13 per cent., 10 per cent. and 9 per cent. The sick and doubtful cases in these places had been treated with arsenicals, and the centres were re-examined in precisely the same way. The index contamination among the healthy non-Bayerized (1,889 persons) was, after 10 months, found to be 1 per cent. This relatively small infection rate shows the prophylactic benefit resulting from treating the sick.

In the following table a comparison is given of the indices of infection amongst the Bayerized and non-Bayerized.

Healthy.	Delay in re-examination. Months.	Index of contamination. Percentage.	Percentage of infection at the 1st examination.
Bayerized (nearly all 2 injections)	7	0·00	18
Bayerized (2 injections)	10	0·22	13
Bayerized (1 injection)	10	0·54	13
Non-Bayerized ...	10	1·00	10

This table shows a definite difference in the index of contamination amongst people examined after 10 months, according to whether or not they previously received Bayer 205. The general conclusion is that, although treating the sick and doubtful cases with arsenicals was in part responsible for the low infection rate found in the second examination, nevertheless, prophylactic treatment with Bayer had a very definite influence.

W. Y.

MAYER (Martin). Die Behandlung und Prophylaxe der afrikanischen Schlafkrankheit mit Germanin (" Bayer 205 "). Kritische Besprechung der bisherigen Ergebnisse und Vorschläge. [**The Treatment and Prophylaxis of African Sleeping Sickness with Germanin. Critical Review.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1928. Oct. Vol. 32. No. 10. pp. 528–542. [44 refs.] [Inst. for Ship & Trop. Diseases, Hamburg.]

In this review the author summarizes a large number of the observations which have been made by various workers with germanin, and then passes to certain general conclusions.

With regard to dosage, he points out that the usual amount given in a day is 1 gm. but that amounts up to 2 gm. have been administered from time to time without harm. The drug is best given intravenously, but in case of necessity it can be given intramuscularly. Turning to the frequency and number of doses, Mayer states that it is quite astonishing how, without any apparent reason, the interpolation of long intervals has not only been retained, but has become the procedure of choice. He summarizes the various schemes of dosage adopted by a considerable number of workers. Mayer states that he adheres to his original view that the best method is 3 to 4 injections of 1 gm. each in the shortest possible space of time. That a total amount of 4 gm. on successive days can be given appears certain. If the dose of choice is 1·5 gm., it can be given on the first, second and fourth days ; 2 gm. doses should be given on alternate days. If a total dosage of 4 to 5 gm., given as quickly as possible, is without action, it is of no use repeating the course of treatment the following week or month. It has been found that on occasion trypanosomes may re-appear in the blood some time after the administration of germanin and remain even for some weeks only to disappear again without further treatment. All experience shows that misplaced and insufficient dosage only results in the production of drug-fast strains.

As additional remedies, the author recommends in early stages an antimony cure (neostibosan) eight days after the course of germanin ; of the arsenic preparations, he considers atoxyl to be best. In the later stages, tryparsamide is to be recommended, but it is not of much use in *T. rhodesiense* infections.

As a prophylactic for mass use among natives, Mayer advises 1 gm. given intravenously and repeated each three months. In Europeans he recommends the same, except that the initial dose should be 2 gm. For sterilization of the blood of advanced cases a three-monthly injection of 1 gm. is advised.

W. Y.

LEDENTU (G.). Où en sont le traitement et la prophylaxie de la maladie du sommeil? [**The Position of Treatment and Prophylaxis of Sleeping Sickness.**]—*Ann de Méd. et de Pharm. Colon.* 1928. Apr.–May–June. Vol. 26. No. 2. pp. 188–210.

The important chemotherapeutic discoveries of late years have completely transformed the outlook of the treatment and prophylaxis of sleeping sickness. In tryparsamide and Fourneau 270 we have powerful trypanocidal remedies which enable us to save a very large

number of apparently hopelessly infected persons ; and the discovery of moranyl [Fourneau 309, probably identical with Bayer 205] permits us to hope that we have a prophylactic agent by which, thanks to its preventive properties, it will be possible to exterminate rapidly the large epidemic foci which still persist in numbers and constitute a permanent danger to surrounding districts.

The author's object in this paper is to indicate what new organization in the campaign against sleeping sickness should coincide with the introduction of the new drugs. He first of all summarizes the results obtained by various authors with these different drugs and then passes on to a consideration of the organization of an anti-trypanosomiasis campaign. Prophylaxis and therapy should go on together, but they are two distinct tasks and necessitate two distinct organizations. The era of the itinerant physician hunting out the patients and confiding to subordinates the care of their treatment must be closed for it no longer meets the necessity of the case. The new drugs render possible a great number of cures, but they require delicate handling, they must be adapted to the individual cases, they demand precise diagnosis and attentive supervision, which can only be obtained in dispensaries specially devised for the purpose. Thanks to moranyl, one sees the time approach when new infections will be reduced to a minimum, but its application to the entire population is a lengthy affair and requires scrupulous exactitude and strict control.

W. Y.

Van den Branden (F.). La première croisière médicale du bateau-hôpital " Belgique." [**The First Medical Cruise of the Hospital Ship "Belgique."**]—*Ann. Soc. Belge de Méd. Trop.* 1928. Sept., Vol. 8. No. 2. pp. 121–142.

Thanks to the initiative of the Governor and of Madame Maurice Lippens, the Belgian Congo has been provided with a fully equipped hospital ship. This ship makes it possible for the medical service to examine and treat rapidly a large number of natives and to render aid to Europeans far removed from medical centres. The first cruise, which lasted 4 weeks, was under the direction of Van den Branden and comprised the stretch of river between Leopoldville and Kwamouth : the principal object was the study of sleeping sickness and to determine the most practicable method of combating the disease.

After a brief account of the results of previous work in this region, the author gives information regarding the number of men, women and children examined and of those found to be infected in each of the 52 posts visited. He points out that but for the ship this work would have taken several months. In all, 3,778 natives were examined in the 52 villages : 168 new cases of trypanosamiasis were discovered, and 620 cases were found to be undergoing treatment. The total infected was therefore 788 (20·8 per cent.)

All the cases were given one injection of tryponarsil and one of Bayer 205. In addition, 50 injections of Bayer 205 were given to cases sent for the purpose from the Tua region. Bayer 205 was also administered prophylactically in three heavily infected regions.

During the voyage one European was found to be infected.

Regarding the organization of the campaign against sleeping sickness in the Kimpolo-Kwamouth stretch, Van den Branden states that the

treatment of all the cases, both new and old, will be continued by native assistants, the region being for this purpose subdivided into five districts.

Other activities which occupied the author's attention during the trip were the vaccination of 2,477 natives, the diagnosis and treatment of 98 cases of yaws, and the determination of the helminthic and malarial indices in three native agglomerations.

W. Y.

Van den Branden (F.). Le "269" et le "417" Fourneau dans le traitement de la trypanosomiase humaine. [**Fourneau "269" and "417" in the Treatment of Human Trypanosomiasis.**]—*Bull. Soc. Path. Exot.* 1928. Oct. 10. Vol. 21. No. 8. pp. 646–651.

With the object of finding drugs which can be administered orally in the treatment of sleeping sickness, the author has tested two arsenical products provided by Fourneau, viz. No. 269, or P-amino-o-oxyphenylarsinic acid, and No. 417, or Formyl-p-amino-o-oxyphenylarsinic acid. These drugs are intended to be used only by the mouth and are amongst the most active of the arsenicals prepared by Fourneau and his collaborators. They are as active when given by the mouth as when given subcutaneously in mice. The dose is not yet definitely determined. The author gave 1 gm. per day in 4 capsules, each containing 0·25 gm. This amount was well borne by the patients. The drugs were tested on cases in the first stage of the disease and also on chronic cases. Details are given.

Of the 5 patients treated with Fourneau 269, one, an advanced case, died after having received 4 gm. of the drug. Another disappeared 2 months after having received 4 gm., his blood having remained sterile up to that period. Of the 3 other cases still under observation, 1, in the first stage, has remained sterile 2 months after having received 13 gm. His cerebro-spinal fluid is normal and the weight has increased by 10 kilos. In the other 2 patients, who were at the commencement of the last stage of the disease, the blood has been sterilized and the cerebro-spinal fluid has returned to normal. The first patient received 28 gm. and the second 42 gm. in courses of 4 gm. given in daily doses of 1 gm.

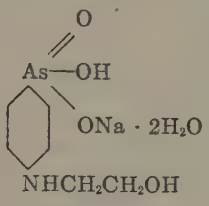
Of the 4 patients treated with Fourneau 417, one chronic advanced case was sterilized, but the cerebro-spinal fluid remained profoundly changed after 46 gm. of the drug. In another case, at the commencement of the second stage of the disease, the blood was sterilized and the cerebro-spinal fluid returned to normal after 12 gm. Of the 2 remaining patients, who were in the first stage of the disease, 1 exhibited a relapse with parasites in the blood after a total dose of 20 gm., the second had a relapse after 4 gm., but remained sterile after 12 gm.

W. Y.

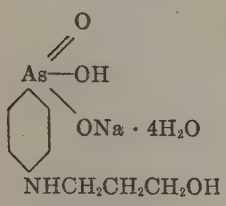
i. Stratman-Thomas (W.K.) & Loevenhart (A.S.). **The Biologic Study of Two New Pentavalent Trypanocidal Arsenical Compounds: the Monosodium Salt of 2-p-Arsono-Anilino-Ethanol (Etharsanol) and 3-p-Arsono-Anilino-Propanol (Proparsanol).**—*Jl. Pharm. & Experim. Therap.* 1928. Aug. Vol. 33. No. 4. pp. 443–457. [9 refs.] [Pharmacol. Lab., Univ. of Wisconsin, Madison.]

ii. Stratman-Thomas (W.K.) & Loevenhart (A.S.). **The Therapeutic Value of Etharsanol and Proparsanol in Experimental Trypanosomiasis in Rats and Rabbits.**—*Ibid.* pp. 459–477. [6 refs.] [Pharmacol. Lab., Univ. of Wisconsin, Madison.]

i. The authors record the biological work done with two new compounds with which they have had very promising results in the treatment of experimental trypanosomiasis. These compounds are etharsanol and proparsanol



Etharsanol



Proparsanol

In making solutions the monosodium salt was dissolved in distilled water; a 10 per cent. solution of etharsanol can be heated in the sterilizer at 15 pounds pressure for 30 minutes without materially increasing the toxicity. All doses given are for the hydrated drugs. The arsenic content of etharsanol is 20·32 per cent. and that of proparsanol 20·68 per cent. The sodium salts, as precipitated from water by alcohol, are white, colourless, odorless, and practically tasteless substances.

The toxicity was studied using mice, rats, guineapigs and rabbits: the drugs were administered intravenously, intramuscularly, subcutaneously, intraperitoneally and orally. The *maximum tolerated dose* (M.T.D.) is the maximum amount per kilo. of body weight which is survived for 21 days by approximately 4 of 5 animals. The *minimum lethal dose* (M.L.D.) is taken as the minimum amount per kilo. of body weight required to kill approximately 50 per cent. of the animals within 21 days. All doses are given in grams per kilo. of body weight.

There is no perceptible difference between the clinical symptoms and pathological findings following the administration of etharsanol and proparsanol. The outstanding features in the course of severe intoxication with these drugs are those common to many aromatic arsonic acid compounds. The symptoms and course of the intoxication in the various animals are described in detail.

It was found that etharsanol produces no effects unless it is given in doses approaching the lethal. On this account and because of its rapid excretion, it can be given repeatedly in very large doses without producing deleterious effects. Thus, while 0·35 gm. per kilo. given intravenously is the M.T.D. for the rabbit, three doses of 0·25 gm. (71·4 per cent. of the M.T.D.) may be given on alternate days without deleteriously affecting the animals. These characteristics also hold good for tryparsamide. The toxicity of proparsanol was studied less intensively than that of etharsanol, because it soon became evident that it is less useful than the latter drug in the treatment of experimental trypanosomiasis and because it is more expensive to produce.

The maximum tolerated and minimum lethal doses are shown in the following table :—

TABLE 14.

Animal.	Administration.	Etharsanol.		Proparsanol.	
		M.T.D.	M.L.D.	M.T.D.	M.L.D.
		grams per kgm.	grams per kgm.	grams per kgm.	grams per kgm.
Mouse ...	Intraperitoneal	0·50	0·75	0·75	1·0
Rat	Intravenous ...	1·25	1·40	1·40	1·75
	Subcutaneous ...	0·90	1·00		
	Intramuscular ...	1·00	1·25		
	Intraperitoneal	0·90	1·00		
Guineapig ...	Subcutaneous ...	0·15	0·25		
	Intramuscular	0·15	0·25		
Rabbit ...	Intravenous ...	0·35	0·50	0·20	0·40
	Intramuscular ...	0·50	0·60		
	Oral	0·30	0·70		

The following are the summary and conclusions :—

" Two organic arsenical compounds have been studied to determine their toxicity for rats, mice, guineapigs, and rabbits. The maximum tolerated and minimum lethal doses are shown in table 14.

" Etharsanol produces no deleterious symptoms until doses approaching the lethal are reached, and three doses of 0·25 gram per kilogram (71·4 per cent. of the maximum tolerated dose) may be given on alternate days without injury.

" The low toxicity of these compounds compared with many other arsenical drugs, together with the fact that these drugs are well tolerated in repeated doses, warrant their study in experimental syphilis and trypanosomiasis.

" Proparsanol differs from etharsanol in having an extra methylene group in the side-chain para to the arsonic acid group. The extra methylene group produces no marked changes in the toxicity or type of action.

" Etharsanol differs from tryparsamide in having a primary alcohol group at the termination of the side-chain while tryparsamide has an acid amide group. This change in structure yields a compound approximately twice as toxic as tryparsamide."

ii. In the second paper, the authors present their work on the therapeutic value of these drugs in experimental trypanosomiasis in rats and rabbits. Rats were inoculated intraperitoneally and rabbits intravenously with 1 cc. of a suspension of trypanosomes having one organism in a microscopic field ; the rats were, as a rule, treated 24 hours after inoculation. In the rat *T. brucei*, *T. equiperdum*, *T. equinum*, *T. lewisi* and *T. rhodesiense* were used ; and in the rabbit *T. brucei*, *T. equiperdum* and *T. rhodesiense* and treatment was instituted at different stages of the disease. Animals treated with etharsanol and proparsanol were kept under observation from three months to two and a half years. The length of life of untreated animals infected with the various strains is given in a table.

The *minimal curative dose* (M.C.D.) is taken as that dose which will cure 4 of 5 animals, and the *therapeutic index* is obtained by dividing the M.T.D. by the M.C.D.

The results obtained show that etharsanol is an exceedingly effective drug in the treatment of experimental trypanosomiasis in rats and rabbits. In rats, the therapeutic index is very high ; in rabbits it is also high, but not nearly so high as in rats. Rabbits were cured late in the disease after involvement of the central nervous system, as evidenced by extreme prostration, lethargy and paralysis. It was found that the brain substance, following the injection of etharsanol, contained large amounts of arsenic. The authors state that they are sure that etharsanol penetrates the tissues of the central nervous system and that it kills the trypanosomes located there. Etharsanol is equally as effective as tryparsamide in clearing the cerebro-spinal fluid of trypanosomes.

In *T. brucei* infection of rats, the curative dose of etharsanol by intramuscular injection is only twice that required by intravenous administration and the therapeutic index is 10. No disagreeable results were noticed on intramuscular injection and there was no tenderness or ulceration at the site of injection. The authors point out the great advantage of a drug which can be used intramuscularly.

As is shown in the table, proparsanol is distinctly inferior to etharsanol, and consequently the authors limit their further discussion to etharsanol and compare its effectiveness with that of tryparsamide. These drugs are quite similar compounds from many points of view ; etharsanol is somewhat more toxic, but both are very rapidly excreted (in man 75 per cent. etharsanol was excreted in 5 hours and 91 per cent. in 4½ days) and neither produces toxic symptoms or organic changes in the tissues until they are used in doses approaching the lethal. Because of their rapid excretion, they can be given at relatively short intervals. The trypanocidal power of etharsanol is the greater, and its therapeutic index is higher, than that of tryparsamide. In the few human cases treated with etharsanol, amblyopia was not seen, but on this point more extensive trial is obviously required. Both drugs cause destruction of trypanosomes in the central nervous system and there appears to be no difference in the ability of the two drugs to cure rabbits late in the infection.

There is a striking difference between the two drugs. In paresis, tryparsamide causes a very remarkable clearing of the mental symptoms in approximately 50 per cent. of cases. Lorenz and Bleckwenn investigated the value of etharsanol in paresis and found that the drug does not cause these cases to clear mentally. In the author's view, this important property of tryparsamide is not related to its treponemicidal power ; it would seem reasonable to assume that tryparsamide has the power to cause resorption of perivascular granulomatous tissue in paresis and thus restore the impaired circulation to parts of the cerebrum, so that they may again function, whereas etharsanol does not seem to have this property. It is doubtful, therefore, whether etharsanol will relieve the clinical manifestations of central nervous system involvement in human trypanosomiasis, notwithstanding its power to kill trypanosomes in the central nervous system. Extensive clinical trial alone can settle the point and, judging from the results obtained in experimental trypanosomiasis, it would seem that its excellent trypanocidal power entitles etharsanol to extensive and carefully controlled clinical trials.

W. Y.

Nattan-Larrier (L.) & Lépine (P.). Essais de traitement des trypanosomiases expérimentales par l'atoxyl associé à l'anatoxine tétanique. [**Treatment of Experimental Trypanosomiasis by Atoxyl and Tetanic Anatoxin.**]—*C. R. Soc. Biol.* 1928. July 27. Vol. 99. No. 25. pp. 557–559. [1 ref.]

In view of the fact that atoxyl aids the immunization of animals to tetanus anatoxin, the authors decided to enquire whether the anatoxin can reinforce the therapeutic action of atoxyl in trypanosomiasis.

Seven series of experiments, each comprising 7 or 8 rats were performed. In each experiment the rats were inoculated with the same quantity of blood of a rat infected with *T. brucei*. One or two rats served as controls and the remaining six were divided into two groups; the first, on trypanosomes appearing in the blood, were given a dose of atoxyl corresponding to 1 cgm. per 100 gm. of body weight, and the second the same dose of atoxyl together with 1 cc. of tetanus anatoxin. On an average, the control rats died in 5 days, those treated with atoxyl alone in 10 days, and those treated with both atoxyl and tetanus anatoxin in 12½ days. It was also found that rats treated with the anatoxin alone died in the same time as the controls. Apparently the site of infection exercised some influence: when the atoxyl and anatoxin were injected at different parts of the body, the duration of life was only 10½ days, whereas when they were introduced at the same point it was 12½ days. Further experiments showed that when the atoxyl and anatoxin were mixed and incubated at 37°C for 24 hours, the therapeutic action was increased since the duration of life was prolonged to 14½ days.

The conclusion reached is that tetanus anatoxin, although it has no therapeutic action, nevertheless is able to reinforce that of atoxyl.

W. Y.

Bacchelli (Giulio). Lo "stovarsol sodico" nella cura della trypanosomiasi umana ed animale. Ricerche sperimentali su animali da laboratorio. [**"Stovarsol sodium" in the Treatment of Trypanosomiasis, Human and Animal. Experiments with Laboratory Animals.**]—*Arch. Ital. Sci. Med. Colon.* 1927. Nov. Vol. 8. No. 11. pp. 621–631. With 4 plates (1 coloured). [2 refs.] [Inst. of Trop. Path., Univ., Bologna.]

Experiments were carried out to test the dosage of this compound as regards its trypanocidal and toxic effects, the results on the trypanosomes themselves, and the curative properties of the drug. Infections with *T. cruzi*, *T. brucei*, *T. evansi*, and *T. marocanum* were tested, the dose ranging to 1 cgm. per kilo. and even higher. The conclusions arrived at were that it did not cut short the infection though it caused a temporary disappearance of the trypanosomes from the peripheral circulation; the trypanosomes become granular and vacuolated, but those not destroyed acquire increased resistance to the stovarsol; the body also acquired a tolerance to the drug and in so far as some of the parasites were destroyed the life of the host was prolonged provided the dose was not a toxic one; when the drug was stopped the trypanosomes soon reappeared and the animal died.

H. Harold Scott.

Schnitzer (R.) & Silberstein (W.). Zum Mechanismus des chemotherapeutischen Heilungsvorganges. Ueber die experimentelle Trennung der Kombination: Chemische Wirkung+Ictus immunisatorius. [**The Mechanism of Chemotherapeutic Curative Processes. The Experimental Separation of the Combination: Chemical Action+Icterus Immunisatorius.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1928. Sept. 24. Vol. 58. No. 1/2. pp. 159–172. [12 refs.] ["Robert Koch" Inst., Berlin.]

The following summary is given :—

1. If mice, which are doubly infected with a normal and a drug-fast strain of trypanosomes, are treated with a drug, against which the drug-fast forms are as resistant as possible, it is found that the drug-resistant forms disappear with the normal forms from the blood. This takes place, however, only when the normal and the drug-fast strains are immunologically identical.

2. If in such mice a relapse occurs only individuals of the drug-resistant strain are found. The parasites affected by antibodies and only these are to be regarded as the starting point of relapses.

W. Y.

Torres (G. Magarinos). Endocardite pariétale dans la maladie de Chagas (trypanosomiase américaine). [**Parietal Endocarditis in Chagas' Disease.**]—*C.R. Soc. Biol.* 1928. Sept. 18. Vol. 99. No. 26. pp. 886–888. [Oswaldo Cruz Inst., Rio de Janeiro, Brazil.]

In the necrosis of the cardiac musculature, resulting from arteriosclerosis of the coronary arteries, and in tuberculous and syphilitic myocarditis, there is often an extension of the lesions from the myocardium to the epicardium, and especially to the parietal endocardium. This raises the question whether the chronic form of myocarditis seen in American trypanosomiasis is not also accompanied by such lesions.

Details are given of the pathological lesions found at the autopsy of two persons, aged 25 and 35, respectively, who died in Brazil, in a region where trypanosomiasis is endemic, from a cardiac form of the disease. One of the patients presented a chronic fibrous parietal endocarditis of the right auricle and of the left ventricle, and a recent endocarditis with the formation of thrombus in the left auricle and summit of the left ventricle. In the other case, a parietal endocarditis was observed in the summit of the left ventricle with subsequent thrombosis. In both cases, the primary and essential lesion was a marked, diffuse, chronic myocarditis presenting the histological characters usually observed in Chagas disease. The post-mortem protocols are given in detail.

W. Y.

Geoghegan (A. J.). Deux nouveaux cas de trypanosomiase américaine humaine dans la province de Catamarca. [**Two Fresh Cases of American Trypanosomiasis in the Province of Catamarca.**]—*C.R. Soc. Biol.* 1928. Nov. 9. Vol. 99. No. 31. pp. 1417–1418.

Hitherto the author had been able to diagnose, in the province of Catamarca, a single case of Chagas' disease by blood examination.

The discovery that 70 per cent. of the *Triatoma infectans* were infected with the flagellates encouraged the examination of further human beings. The blood of 400 persons was consequently examined and two infections were found. The author considers that the disease is not so rare as is commonly believed.

W. Y.

DUKE (H. Lyndhurst). **Immunological Studies of** *Trypanosoma gambiense* **and** *T. rhodesiense*.—*Parasitology*. 1928. Dec. Vol. 20. No. 4. pp. 427–447. [3 refs.] [Human Trypanosomiasis Research Inst., Entebbe, Uganda Protectorate.]

The author refers to his work on the transmissibility of the human trypanosomes by *Glossina palpalis*. As a result of these observations, which are recorded in the Final Report of the League of Nations Commision [this *Bulletin*, Vol. 25, p. 759], Duke concluded that a number of the human strains which passed through his hands at the Entebbe Laboratory were either in man himself, or on first isolation in laboratory animals, non-transmissible by the cyclical method by tsetse. After reviewing the available evidence, it was further provisionally concluded, that it is of supreme importance to *Trypanosoma gambiense* (and probably also to other species of trypanosomes) that the vertebrate host be frequently exposed to tsetse during the early stages of its infection before the transmissibility of the strain is impaired. In nature this requisite will be fulfilled when susceptible hosts are numerous and the contact between them and the fly is close. Under such circumstances the trypanosome will be found widely distributed, *i.e.*, a high percentage of the principal vertebrate hosts will be infected and the transmissibility of the strains will be high. It was also pointed out that this frequent passage of the parasite from host to host might aid the propagation of the trypanosome in another way, by affording frequent opportunity for re-infection or super-infection of the same host by fresh strains.

The main objects of the experiments in the present paper were :—

" 1. To determine whether infection of a mammal with *T. gambiense* confers any immunity against subsequent infection by (*a*) the same strain, (*b*) a different strain of this trypanosome, or (*c*) by *T. rhodesiense* or *T. brucei*.

" 2. If infection results in the above circumstances and no solid immunity is demonstrated, we then have to inquire whether there is any finer or less obvious reaction produced by a long-standing infection : such, for example, as might be manifested by changes in the transmissibility by tsetse of succeeding infecting strains of trypanosomes, when these are introduced into the blood stream of the animal under investigation.

" To investigate this, an infected animal was selected in which the strain of trypanosomes had, in the course of time, lost its transmissibility. Flies, infective with a readily transmissible strain of *T. gambiense*, from the same or a different patient, were then fed upon the animal. After a sufficient incubation period had elapsed for the new strain to appear in the peripheral circulation, clean flies were applied and the transmissibility of the now bivalent infection examined. In some instances the investigation was extended to include a third exposure to infection, after a suitable interval.

" Concurrently, similar experiments were performed in which animals carrying a strain of *T. gambiense* that had become non-transmissible by tsetse were superinfected by flies carrying either *T. rhodesiense* or the Damba trypanosome (*T. brucei* type)."

In these experiments, the technique employed was that described in the Final Report of the International Commission. Before proceeding to consider the actual experiments, Duke sounds a note of warning. He points out that all the experiments have one defect in common, viz., the number of flies employed is, of necessity, small, and, mathematically, there is a wide margin of error in drawing inferences from the data. Efforts have been and are now being made by concentrating attention on one or two strains to remedy this shortcoming.

After recording the observations in detail, the following provisional conclusions are reached :—

" I. Natural immunity against *T. gambiense*, as exhibited by sheep and goats, varies from complete immunity to a degree of susceptibility in which the trypanosome may be a contributory, or even, possibly, the direct cause of death. This last contingency is, however, beyond doubt exceedingly rare. Between these extremes we find a peculiar partial immunity which operates solely on the transmissibility of the trypanosome by tsetse, abolishing this property, but leaving the strain still capable of producing gut-infections in tsetse and still demonstrable in the peripheral blood.

" It is as yet impossible to state whether this loss of transmissibility is attended by any coincident increase in the general resistance of the mammal against the trypanosome infection.

" II. Immunity can be *acquired* by sheep and goats against *T. gambiense*. The earliest manifestation of the development of acquired immunity is the disappearance of the transmissibility of the strain by tsetse.

" The development of immunity may be arrested at this stage for a considerable time, the strain meanwhile retaining the power to develop in the gut of the fly ; or it may continue until the animal is both sterilised of an existing infection and immunised against subsequent infection with the same species of trypanosome. Once established, absolute immunity may persist for at least six months.

" When once the first stage of immunisation is reached by an animal, all strains of the same species of trypanosome subsequently introduced into its blood will produce non-transmissible infections. In other words, the animal, though still infected, has been rendered non-infective for at all events a considerable time.

" III. Certain individual animals that are susceptible to infection, attain, instead of the partial immunity that we have just described, a condition of equilibrium with the trypanosome. The parasite then causes no inconvenience to its host, and retains its transmissibility by tsetse for a considerable time (at least 15 months).

" This state of affairs resembles that described in certain species of antelope infected with *T. gambiense*. We do not yet know whether such a strain preserves its power of infecting man throughout its long sojourn in ruminant blood.

" IV. In the case of one of the two monkeys studied, a different type of partial immunity was observed. The transmissibility of the original infecting strain disappeared. Subsequent infection with a transmissible homologous strain temporarily restored the transmissibility in diminished intensity. A third, and this time heterologous transmissible strain then caused a striking increase in the transmissibility. The monkey remained all this time apparently in good condition.

" Here is a phenomenon without exact parallel in sheep and goats. This animal had apparently developed a gradually increasing resistance to the trypanosome, but the poise between host and parasite was much less perfect than that attained in Sheep 161.

" Monkeys are much more susceptible to the pathogenic action of *T. gambiense* than are ruminants. So, also, is man. It is very seldom that a monkey succeeds against *T. gambiense* as No. 95 has done, but in the case of man many instances are known of prolonged survival after infection by this trypanosome.

"What we have noted in the case of Monkey 95 may thus easily occur in man, in regions where *T. gambiense* exists in nature. It is possible, particularly in certain regions of Western Africa where human trypanosomiasis is found as a very chronic affection endemic for many years, that there exists in man a condition of equilibrium between parasite and host similar to that obtaining in certain ruminant animals."

W. Y.

CORSON (J. F.). **A Note on Some Inoculations of Animals from Cases of Sleeping Sickness (*Trypanosoma rhodesiense*) in the Ikoma District of Tanganyika Territory.**—*Jl. Trop. Med. & Hyg.* 1928. Sept. 1. Vol. 31. No. 17. pp. 214–216. [4 refs.]

The only form of sleeping sickness known in the Ikoma area is that caused by *T. rhodesiense*, which is almost certainly transmitted there by *Glossina swynnertoni*. Oxen, sheep, and goats are kept in fairly large numbers in the villages where tsetse flies are relatively scarce. There are also some dogs. Where tsetses are numerous, domestic animals cannot survive, and it has been proved that infection with polymorphic trypanosomes rapidly occurs if these animals are exposed to wild tsetse flies in certain parts of the district. In May, 1926, the author inoculated six local sheep of the sleeping sickness area with the blood of five untreated cases of sleeping sickness; all became infected and died about two months later, except one which lived for five months. Subinoculation into white rats was successful in each case; these rats usually lived for about forty days, which was about the average duration of life of white rats directly infected from man. The sheep were adults and in good condition before inoculation, and were kept for a time in a nearly fly-free area, and shortly afterwards conveyed to a fly-free place outside the sleeping sickness area. As the blood was negative for some time after infection, the question of natural infection with *T. brucei* may be almost excluded. The fact that there were no failures warrants the view that most of the local sheep are susceptible to direct infection from most of the human cases of sleeping sickness. In the same month, a young dog was infected from a patient and the infection subsequently transmitted directly to two other dogs successively and to white rats.

In July, 1927, three sheep and three goats of a fly-free area were inoculated with three strains of *T. rhodesiense* conveyed in white rats infected from sleeping sickness patients of the Ikoma district. Two strains infected the animals, a sheep and a goat in each case, while the third strain failed to infect either a sheep or a goat. The infected animals, except one which was apparently killed by a hyaena, died within two months.

Reference is made to the recent work of KLEINE, who inoculated twelve strains of *T. rhodesiense* from untreated patients into guineapigs, and showed the differences in morphology of the trypanosomes of different strains, and the variations in the percentages of posterior-nuclear forms from time to time in the course of the infection. The author made similar observations on six other strains in the same area. He did not see any posterior-nuclear forms in the long and slender trypanosomes, and remarks that the nucleus was not regarded as posterior, unless it was within a distance of its own diameter from the blepharoplast. In none of the trypanosomes was the nucleus on a level with the blepharoplast or posterior to it. It seemed advisable to inoculate more than one animal from the same patient at the same

time, using equal amounts of blood, so that two guineapigs were inoculated from each case, and in the first three strains two white rats also. The details are shown in a table. The results of the inoculation of one of the strains showed that virulence for the animals is not necessarily associated with polymorphism and the presence of numerous posterior-nuclear forms. In all the four animals infected with this strain, the trypanosomes multiplied very rapidly and remained almost without exception long and slender, and killed the animals quickly. The number of posterior-nuclear forms appears to depend on the kind of animal used, the percentage in guineapigs being greater than in white rats.

Inoculations of white rats from relapsed cases previously treated with " Bayer 205," with or without other drugs, gave results from which only indefinite conclusions can be drawn as is shown in a table. In such cases the trypanosomes in the blood vary much more in number from day to day than in untreated cases. In a single case where they were observed in a thick film on the day of inoculation, the injection of 2 cc. of blood failed to infect the rat. It may be suggested that relapsed cases, after previous treatment with " Bayer 205," are less of a public danger than untreated cases even though the former, being usually less continuously ill, can get about more, and so are more exposed to tsetse flies when these are not in the villages.

W. Y.

Stern (L.) & Rosengolz (H. P.). L'effet de la trypanosomiase expérimentale sur la barrière hémato-encéphalique. [**The Effect of Experimental Trypanosomiasis on the Haemo-Encephalic Barrier.**]—*C.R. Soc. Biol.* 1928. Oct. 19. Vol. 99. No. 28. pp. 1108–1110. [Med.-Biol. Inst. & Experim. Vet. Inst., Moscow.]

The authors investigated the changes in the resistance of the haemato-encephalic barrier to the passage of certain colloids and crystalloids in animals experimentally infected with trypanosomes. The observations were made on dogs and rabbits infected with *T. equiperdum.* The animals were examined during the incubation period, the first febrile period, the apyrexial period, and the subsequent relapses. The procedure consisted in sub-occipital puncture and examining the cerebro-spinal fluid for the substances previously injected into the blood, viz., NaI, $Na_4Fe(CN)_6$, trypanblue, and antibody.

In dogs the resistance showed no change in the incubation period during the first paroxsym NaI, and $Na_4Fe(CN)_6$, appeared in the cerebro-spinal fluid, and the diminution in resistance to these crystalloids persisted during the apyrexia and subsequent pyrexias (35–40 days). The permeability for $Na_4Fe(CN)_6$ was more marked than for NaI. Trypanblue was found quite definitely in 10 per cent. of cases, doubtfully in 20 per cent. and was entirely absent in 70 per cent. The natural antibody was never found.

In only two rabbits were parasites found in the blood, but infection was demonstrated in the other animals by inoculation of spleen pulp or blood into mice. During the acute stage the resistance of the barrier was lowered to NaI and $Na_4Fe(CN)_6$. In animals with cachexia, keratitis, paresis, oedema, etc., the resistance was lessened both to the crystalloids and to trypanblue. In most of the animals the injection of trypanblue was quickly followed by death.

W. Y.

Nattan-Larrier (L.), Ramon (G.) & Lépine (P.). Anticorps naturels et perméabilité placentaire. [**Natural Antibodies and Placental Permeability.**]—*C.R. Soc. Biol.* 1928. May 18. Vol. 98. No. 15. pp. 1279–1281.

The human placenta does not permit of the passage either of the natural anti-sheep haemolysin or of the substance which exercises a protective action against trypanosomes. This raises the question whether these natural antibodies do not possess a different protein support from that of the artificial antibodies, *e.g.*, diphtheria and tetanus antitoxins or artificial haemolysins, which can pass from the mother to the foetus. Previous studies on the fractional precipitation of antitoxic sera have established that the pseudo-globulin contains almost the whole of the diphtheria and tetanus toxins, whilst the euglobulin contains only a very small quantity, and the sero-albumin contains none. These facts led the author to investigate what fractions of human serum possess the antitrypanosomal power and which contain the anti-sheep haemolysin.

As a result of their work it was found that the pseudo-globulin is the principal, if not sole support, of the antitrypanosomal substance of human serum, whilst the protein support of the anti-sheep haemolysin of human blood is euglobulin. But, although they have different protein supports, the anti-trypanosomal substances and the anti-sheep haemolysin are both equally incapable of passing the placenta. Since the placenta is permeable to artificial antibodies, *e.g.*, diphtheria and tetanus antitoxins, and is not permeable to the anti-trypanosomal substance, it appears that the impermeability of the placenta to natural antibodies is not due to their protein support.

W. Y.

Leupold (Frida). Untersuchungen über Rezidivstämme bei Trypanosomen mit Hilfe des Rieckenberg-Phänomens. [**Investigations with the Rieckenberg-Phenomenon on Relapse Strains of Trypanosomes.**]—*Ztschr. f. Hyg. u. Infektionskr.* 1928. Sept. 10. Vol. 109. No. 1. pp. 144–156. With 2 text figs. [7 refs.] ["George-Speyer" House, Frankfurt a.M.]

Rieckenberg described in 1917 a phenomenon which occurred when the blood of a mouse or rat cured after a trypanosome infection was mixed with blood containing homologous trypanosomes. This phenomenon is known as the Rieckenberg reaction [thrombocytobarin or adhesion phenomenon]. On the admixture of the blood from the cured animal, a drop of blood containing the same trypanosomes, and a drop of citrated bouillon, the blood platelets became fixed to the flagellar end of the trypanosomes. Small masses of platelets thus became adherent to the trypanosomes or lay upon them, and finally completely enveloped the actively motile parasites. Rieckenberg found that this phenomenon only occurred with homologous strains. Furthermore, it was ascertained that the phenomenon occurred not only with mice, but with guineapigs and rats; and Rieckenberg showed that relapse strains of trypanosomes behaved as heterologous strains. Rieckenberg did not regard the phenomenon as an antibody reaction, but evidence in support of this was later produced by Kritchewsky and his colleagues. Since the reaction is very easy and can be made in a few minutes, it is suitable for study of

immunity processes, and especially of relapse strains in trypanosomes and recurrent fever, because it permits in a short time of a decision on the immuno-biological properties of the parasites. The author decided to investigate this subject. A number of mice at the height of the infection with *Trypanosoma brucei*, strain Prowazek, were cured with neosalvarsan and after several days killed and bled. From this immune blood the serum was obtained. If this serum was directly employed for the Rieckenberg reaction by mixing with trypanosome-containing blood of homologous strains, marked agglomeration of the trypanosomes very easily occurred, so that the characteristic adhesion phenomenon of blood platelets was masked. For this reason, the serum in doses of 0·25 to 0·5 cc. was injected intraperitoneally into normal mice. After 24 hours the mice contained in their blood a sufficient amount of substance to produce the Rieckenberg phenomenon without the occurrence of the agglomeration trypanosomes.

The author summarizes the results of his work as follows :—

1. The blood platelet test of Rieckenberg has furnished useful results in the differentiation of relapse strains of trypanosomes. There is agreement between the re-infections method and the blood platelet reaction.

2. The Rieckenberg method, which was re-examined in the case of recurrent fever spirochaetes by Kritchewsky and Brussin, and found by them to be useful, is thus to be recommended as a simple procedure for the identification and differentiation of trypanosome strains. The conclusion reached by Kritchewsky and others, as a result of their experiments, that the blood platelet test is dependent on the presence of specific antibodies which act on the homologous trypanosomes is confirmed. The blood platelets take a secondary part in the procedure.

3. Serum containing antibody can be conserved in the ice box, and for the demonstration of the reaction be injected into normal mice. The blood of these passively immunized mice gives the reaction for days or even weeks without the appearance of the disturbing agglomeration phenomenon of the trypanosomes.

4. In completion of the observation of Ritz that the number of possible relapse trypanosome strains, in the course of a chronic infection of mice produced artificially through sub-therapeutic doses, may be unlimited, it was found that the following relapse strains were obtained in the first paroxysm : in over 50 first relapses occurring in different mice, and on different days, 56 per cent. corresponded to Type I_{144}, 20 per cent. to Type I_{108}, whilst in 20 per cent. the so-called binary type appeared which reacted with both immune receptors ; in only 4 per cent. did other kinds of receptors appear which seemed to have no relationship to the antibodies obtained from the many relapse strains. The variation capacity of trypanosomes of the first relapse is thus limited.

W. Y.

Dubois (A.). Mort par hypoglycémie dans les trypanosomiases aiguës. [**Death from Hypoglycaemia in Acute Trypanosomiasis.**]—*C.R. Soc. Biol.* 1928. July 27. Vol. 99. No. 25. pp. 656–657. [2 refs.] [Bact. Inst., Louvain.]

Experiments are recorded which suggest that in certain acute trypanosomiases of guineapigs and mice death is due to hypoglycaemia. The observations were made on two guineapigs and six mice at a time when the blood swarmed with parasites and when the clinical signs indicated that dissolution was imminent. In seven of the eight animals

in this condition subcutaneous injection of glucose (10 cgm. for a mouse and 1 gm. for a small guineapig) produced a veritable resurrection. Within 5 to 10 minutes the animals got up and commenced to move about, and, in the most striking cases, appeared normal and began to feed. In one instance laevulose replaced glucose with the same results: lactose was inactive. The duration of life following the injections was usually short, but sometimes as long as 24 to 36 hours. The author states that he does not believe that repeating the injection would have prolonged life to any great extent.

W. Y.

LEDENTU (G.). Au sujet des trypanotoxines. [**Trypanotoxins.**]—*Bull. Soc. Path. Exot.* 1928. July 11. Vol. 21. No. 7. pp. 544–551. [12 refs.]

The clinical phenomena observed in trypanosomal infections appear so clearly due to an intoxication that the early workers spent much time in attempting to demonstrate the existence of soluble products. A brief review of the literature of the subject shows, however, that these researches have not been rewarded with any great measure of success. BECK, LAVERAN and PETTIT, and others, performed experiments which they considered demonstrated the existence of a trypanotoxin, but these results do not carry conviction and might well be due to anaphylaxis as has been suggested by MARCORA, MUTERMILCH and many other workers.

Ledentu points out that in all the earlier work, the extracts of trypanosomes were injected intraperitoneally or intravenously, and that such routes are much more likely to result in the production of anaphylactoid phenomena than the subcutaneous route. In all his experiments, subcutaneous injections only were given, but he admits at once that his experiments were not more fortunate than those of his predecessors. In his work he used *T. brucei*, *T. equiperdum* and *T. gambiense* obtained from rats at the height of infection. With each of these strains he performed three groups of experiments.

In the first, the trypanosomes isolated by centrifuging citrated blood were washed in saline, dried for some hours at 37° C., ground up, and then taken up with saline. Of the 32 mice injected subcutaneously with doses varying between 0·05 gm. and 0·1 gm. 20 survived and 12 died. Those which survived were not immune, not even after several doses of the extract. The deaths occurred between 24 hours and 6 days, average 4 days after the injections. In 4 of the 12 fatal cases, the extract was very pure and contained but few red cells, whereas in the other 8 cases red cells were present in fair numbers, so that the extract was of a red-brown colour. Contrary to the view of LAVERAN and PETTIT, the author has enquired whether the presence of the damaged red cells did not influence the result. From the post-mortem appearances and from experiments with red cell extracts alone, Ledentu reached the conclusion that they did.

In a second group of experiments an attempt was made to get rid of the formed elements of the blood by means of a rabbit anti-rat serum. This serum could be injected into the infected rats in a dose of 1 cc., or it could be mixed *in vitro* with the infected blood with or without the addition of guineapig complement: the trypanosome extract was then

obtained as before. These experiments did not give any positive result : 12 mice injected with 0·05 gm. presented only evidence of slight indisposition.

In the third group of experiments, which were based on the general view that toxins belong to the albumin group and antitoxins to the globulin group, the author attempted to ascertain whether evidence of the presence of these bodies could be demonstrated in the serum of infected animals or in autolysed trypanosomes. The proteins were isolated as follows : the globulins by half saturation with ammonium sulphate, filtration and washing ; and the albumins in the filtrate by complete saturation with ammonium sulphate. The products obtained were re-dissolved in water and purified by dialysis in small collodion sacs. Among the 30 mice and 2 guineapigs, injected with 0·05 gm. to 0·1 gm. for a mouse and 0·25 gm. for a guineapig, 8 deaths occurred, but these did not appear to be due to a trypanotoxin, but either to repetition of the injections, or to lack of purity of the material, which contained traces of the very toxic sulphate of ammonium. Attempts to separate the proteins in the trypanosome bodies did not give more satisfactory results.

On summarizing his work and that of others, the author concludes that laboratory experiments do not permit of any conclusion on this subject. He has not been able to obtain any clear and definite evidence of toxins. It is necessary, however, to remark that the physiology of the trypanosomes utilized in all laboratory experiments is profoundly modified by the artificial biological conditions to which they are submitted. The clinical signs occurring in the course of the infection clearly support the view of an intoxication, viz., the asthenia, headaches, fever, transient erythemata, palsies, delirium, somnolence and coma are classical signs of all septicaemias. The toxin secreted by trypanosomes may indeed be but slightly active, as is the case with many of the bacteria ; but the fact that in acute dourine the animal succumbs with paralytic signs, although the trypanesomes are very scanty in the blood and are localized in the oedematous plaques, suggest a true toxaemia. On the contrary, *T. lewisi* may swarm in the blood and cause no symptoms.

In conclusion, the author believes on clinical grounds that the existence of trypanotoxins is very probable, but for the time being they are not demonstrable experimentally.

W. Y.

Gutiérrez Lara (J.). Notas previas sobre la formol-gelificacion en la tripanosomiasis humana. [**Note on the Formol-Gel Test in Human Trypanosomiasis.**]—*Med. Países Cálidos.* Madrid. 1928. July. Vol. 1. No. 4. pp. 377–378. [3 refs.]

The author carried out this test on cases of trypanosomiasis at various stages and reports that he found it positive in 80 per cent. of patients, and that it is a valuable diagnostic aid in the early stages even when only one or two small glands are present. He finds that in the second stage of the disease within an hour of injection of " Bayer 205" the result is positive, when no trypanosomes can be found in the blood.

H. Harold Scott.

Furukawa (Hotsuka). [**Immunological Studies on Experimental Trypanosomiasis. III Communication. On Anaphylaxis by Trypanosoma.**]—*Fukuoka Ikadaigaku Zasshi.* (*Jl. Fukuoka Med. Soc.*) 1928. Feb. Vol. 21. No. 2. [Summarized in *Japan Med. World.* 1928. May 15. Vol. 8. No. 5. p. 136.]

It is possible to produce anaphylactic shock by trypanosome proteins. The author carried out a series of studies along this line, and found that it was possible to distinguish, by the aid of this phenomenon, pathogenic trypanosomes from *Trypanosoma lewisi*. He also studied the resistance of the anaphylactic antigen to physico-chemical influences.

W. Y.

Hoare (Cecil A.). **Studies on *Trypanosoma grayi*: the Effect of Goat's Blood.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1928. Aug. 22. Vol. 22. No. 2. pp. 131–136. [3 refs.] [Inst. for Research in Trypanosomiasis, Entebbe, Uganda.]

The individuality of *T. grayi* was first recognized by Minchin, Gray and Tulloch (1906, 1907), who, in addition to distinguishing the parasite from *T. gambiense* on morphological characters, believed they had discovered a physiological difference. This consisted in adding a drop of goat's serum to the teased contents of a fly's intestine containing *T. grayi* in large numbers; for comparison a similar preparation was made with *T. gambiense* obtained from an infected rat; it was found that *T. grayi* rapidly became immobilized and died while *T. gambiense* was not affected by the serum. When the experiments were repeated with human serum neither trypanosome was affected. Kleine and Taute found that the percentage of wild *G. palpalis*, fed on a goat for 4 weeks, infected with *T. grayi* was 1·7 as compared with 10 found in unfed flies of the same locality. The flagellates in the positive flies were furthermore found to have degenerated and Kleine and Taute thus considered that they had confirmed the observation of Minchin and his colleagues that goat's blood kills *T. grayi*. Prates (1926), however, who reinvestigated the matter, found that *T. grayi* retained their normal activity in goat's serum for several hours.

In view of the discrepancy in the results obtained by these workers, it seemed to Hoare desirable to repeat the experiments in question on a wider scale and with proper controls. As the result of this work, he states that he was able to show conclusively that goat's blood has no special effect upon *T. grayi*, whether used *in vitro* or *in vivo*, the proportion of infected flies in the latter case not differing appreciably from that found in unfed flies or in those fed on other animals.

W. Y.

Raiziss (George W.) & Severac (M.). **Standardization of the Trypanocidal Test and of the Trypanocidal Value of Arsphenamine based on more than One Hundred Tests.**—*Arch. Dermat. & Syph.* 1928. Aug. Vol. 18. No. 2. pp. 263–270. [7 refs.]

For the last six years *Trypanosoma equiperdum* has been used by many investigators in standard tests to determine quantitatively the

therapeutic value of arsphenamine. The authors have sought to improve the method. As a result of 100 tests they believe that arsphenamine of definite therapeutic quality should sterilize rats infected with *T. equiperdum* in a dose of 0·006 to 0·008 gm. per kilo. by the intravenous route.

A. G. B.

Akazawa (Sasao). [**Comparison of Germanin and Naganol in the Antitrypanosomal and Antispirochetal Activities. Behaviour of *T. gambiense, T. evansi* and *T. equiperdum* against the Prophylactic Action of " Bayer 205."**]—*Jl. Japan. Soc. Vet. Sci.* 1928. June. Vol. 7. No. 2. [In Japanese. English summary pp. 17–18.] [Govt. Inst. for Vet. Research, Fusan.]

The following summary is given :—

" 1. With a large dose of 0·005 g. per head, germanin protects mice positively against the trypanosomal infection for 4 months after injection, while naganol keeps them non-infective for 3 months.

" 2. These two drugs, in a small dose as 0·00005 g., exhibit no difference in the prophylactic action, both uniformly preventing mice from the infection for 4 days after application.

" 3. A dose of 0·005 g. germanin per 20 g. of body-weight rendered the blood of mice heavily infected sterile in 12–16 hours after injection, the same dose of naganol sterilizing them in 14–20 hours.

" 4. The application of small doses, such as 0·001, 0·00005 and 0·00003 g. does not distinguish the two preparations in the therapeutic power.

" 5. In case of a combination chemotherapy with the recidive dose of neosalvarsan (1 : 700) or tartar emetic (1 : 3000) on one hand and the non-influential dose of germanin or naganol (0·00001 g.) on the other, no difference in the sterility was detected between the two chemicals under discussion.

" 6. In the combination chemotherapy with 1 : 3000 of tartar emetic and 0·00001 g. of germanin or naganol, we observed so-called " antimutative action " (Morgenroth) of the latter.

" 7. Against the infection with *Sp. morsus-muris*, " Bayer 205 " in a large amount as 0·005 g. rendered the infected mice apparently sterile only for 1–4 days after introduction. The spirocheticidal influence of germanin, however, is somewhat superior to that of naganol.

" 8. A dose of 0·005 g. germanin kept the blood of mice infected with *Sp. duttoni* free from microbes for 6–8 days after injection, while naganol of the same dose showed no noticeable therapeutic action.

" 9. Concluding from the foregoing results, germanin seems to be more effective than naganol in both prophylactic and therapeutic activities against the trypanosomal and spirochetal infection.

" 10. By the prophylactic application of " Bayer 205 " (0·005, 0·0001 and 0·00003 g.), the duration of protection is shortest against the most virulent *T. gambiense*, longer against the less virulent *T. evansi* and longest against the least virulent *T. equiperdum*."

W. Y.

Levy (Siegfried). Untersuchungen ueber den Gehalt des kindlichen Blutes an trypanozider Substanz. [**Investigations on the Trypanocidal Substance Content of Children's Blood.**]—*Jahrbuch f. Kinderheilk.* 1928. Vol. 120. Ser. 3. No. 5/6. pp. 325–335. [8 refs.] [Infants' Home, Hamburg.]

After referring briefly to the literature of this subject, which has already been reviewed at length in this *Bulletin*, the author states that

the phenomenon seemed so interesting that he decided to re-investigate it with the abundant material at his command. In all, he performed 95 experiments using the technique of his predecessors. These experiments are summarized in 8 tables.

The experiments confirm the finding of ROSENTHAL that the trypanocidal substance of human serum has nothing to do with the normal antibodies. This statement is based on the result of observations made with blood from the umbilical cord and retroplacental blood, both of which protected mice against nagana. It was further shown that the trypanocidal substance was present in a whole series of infants at the third week of life ; this is in contradiction to the findings of NEUMARK and POGORSCHELSKY (1925). Atrophic conditions and infections could not be demonstrated unequivocally to exert any influence on the trypanocidal substance. Even serum taken shortly after death exhibited a definite protective action in cases in which it had been shown to be protective in life.

W. Y.

RABIES: A REVIEW OF RECENT ARTICLES. X.*

Before proceeding to the review of articles referring to rabies in particular I would draw the attention of all rabies workers to an article on filtrable viruses in general. In this stimulating and suggestive address BOYCOTT[1] examines the foundations of our beliefs regarding the nature of filtrable viruses, and in particular discusses the transition of "live" to "dead." After a masterly exposition of the analogies which exist between the live and the dead, as regards their integral nature, the possibility of transformation of one type into another, capacity for self repair, variability, mass action phenomena, and cyclic changes, he concludes that the antithesis is a false one,—that there are "things which are not so live as a sunflower, and not so dead as a brick," and that filtrable viruses and similar agents represent part of this intermediate group. He then marshalls some interesting facts regarding the size of filtrable viruses, their composition, metabolism, stability and resistance to harmful agents, and their incapacity for independent life. Finally, in discussing the question of multiplication he examines the views held as to their origin, whether *de novo*, or from external infection, basing his deductions largely on the Rous virus, and concludes :—

"We seem to have a fairly definite group of things which : (*a*) are very small ; (*b*) can multiply ; (*c*) have no independent life ; (*d*) are of uncertain origin. Of their multiplication we know that the association of live cells is necessary, and that it occurs when the specific agent is manifested : we do not know that direct multiplication is possible at all. Of their origin, we have strong grounds for thinking that some are derived from live cells, and we cannot exclude this ancestry for any of them. They seem, too, to form a series : (1) the growth promoting substances from tissues show indirect multiplication but make no other suggestion of life ; (2) lysozyme would pass for an enzyme except that it can multiply (in the presence of *M. lysodeikticus*) ; (3) the Rous agent and the bacteriophage arise repeatedly in malignant tumours and bacteria respectively, and may be in some sense alive, but they are not independent species of animals or plants ; (4) the pathogenic viruses represent a further step towards being wholly alive. Taking one thing with another, I am inclined to think that they are both the cause and the result of their diseases, as SANFELICE suggested for epithelioma contagiosum. Somehow or other a virus arises in an animal or plant and by its action on the tissues causes them to produce more of itself. Some viruses (*e.g.*, smallpox) acquire a considerable capacity of spreading from infected to normal individuals and the majority of cases of the disease are so caused ; the virus is on the way towards independence. Others (*e.g.*, herpes) have little or no power of dispersion and most cases are due to the virus arising *de novo* under the appropriate stimulus (whatever that may be)."

Detached quotations are never satisfactory and are often misleading. The article should be read as a whole. It is a quarry of erudition and of suggestive ideas.

Clearly, then, the virus of rabies is one of the most "live" of the filtrable viruses, and in this sense its behaviour approximates to that of pathogenic bacteria. But the characteristics which are evidenced mainly by the more lowly members may also pertain in some degree to rabies virus, and in studying rabies they should not be set aside.

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* For the ninth of this series see Vol. 25, pp. 706–715.

[1] BOYCOTT (A. E.). The Transition from Live to Dead : the Nature of Filtrable Viruses.—*Proc. Roy. Soc. Med.* 1928. Nov. Vol. 22. No. 1. pp. 55–69 (Sect. of Path., pp. 1–15). [2 refs.]

In studying the questions of the nature of the rabies virus, of its behaviour with regard to the formation of inclusion bodies, of its possible cultivation, due regard must be paid to the characteristics of filtrable viruses in general.

i. *Virus.* Another thoughtful paper is that by Busson[2] on the characteristics of fixed virus. He found that when fixed rabbit virus was subpassaged through guineapigs, the salivary glands were highly infective, and that the virus contained in them approximated to the type of street virus. At the same time the virus contained in the brain behaved like the original fixed virus. The incubations after gland inoculation were long, but on subpassage they returned to the normal period, or in rare instances consumptive rabies developed. Thus in a large proportion of animals inoculated with salivary gland the virus was more highly concentrated in the glands than in the nervous system. That the long incubations observed after infection with glands was not due to a weakening of the virus is shown by the fact that after a year of gland passages, the incubation when the brain is subpassaged remains unaltered, although the duration of the sickness may be prolonged, owing, in the author's opinion, to a lowered toxicity.

Thus apparently, the fixed virus of the salivary gland must be classed as lying intermediately between ordinary fixed virus and street virus.

The characteristics of ordinary fixed virus are high toxicity, and sharply defined incubation period. Those of street virus are high infectivity and absence of the organo-specific characters which are developed by passage from brain to brain. The lengthening of the duration of disease in inoculations with salivary gland are an expression of lowered toxicity ; indeed all the symptoms of rabies and the corresponding pathological changes are the result of toxic action. Thus in conclusion the term fixed virus is only relative, and fixed virus, as it is found in salivary glands, has quite other characteristics from fixed virus passed from brain to brain.

In a paper which follows the last, Schweinburg[3] shows that in contrasting various strains of street virus, by subdural inoculation, the incubation period is not related to the minimum lethal dose. Thus with incubation periods of 9, 9, 16, 30 and 16 days the corresponding lethal doses were one 2,000th, one 5,000th, one 8,000th, one 2,000th and one 700th of a milligramme respectively. He states that for the rabbit inoculated subdurally the minimum lethal dose of fixed virus is greater than that of street virus. In a series of experiments in which fixed virus was subpassaged through guineapigs, the lethal dose to subdural inoculation fell from one 500th to one 90,000th, whilst infectivity by the subcutaneous and intramuscular routes, which initially was absent, reappeared. In this series the incubation period with subdural inoculation remained unchanged. In another series in which street virus was employed, reduction of the minimum infecting dose was accompanied by a shortening of the incubation period.

It will be seen that these authors have studied viruses with regard to their (1) infectivity (*i.e.*, minimum lethal dose when injected subdurally), (2) the incubation period which they induce (which is related

[2] Busson (B.). Charakteristik des Begriffes Virus fixe.—*Wien. Klin. Woch.* 1928. Aug. 9. Vol. 41. No. 32. pp. 1145–1149. [Federal Rabies Vaccine Inst., Vienna.]

[3] Schweinburg (Fritz). Zur Frage der Virulenz des Virus fixe.—*Wien. Klin. Woch.* 1928. Aug. 9. Vol. 41. No. 32. pp. 1149–1151. [Federal Rabies Vaccine Inst., Vienna.]

to organ-specificity), (3) the duration of the resulting sickness (which measures their toxicity). The first characteristic is, in bacterial diseases at least, a function of " lag " in rate of multiplication operating against existing antibodies, as has been shown by Hedley WRIGHT in the case of the streptococci. The second is related to the rate of multiplication, and depends upon the culture medium. The third is due to the deleterious action of each individual organism, and may be called its specific toxicity. These three characteristics are fundamental, and in comparing strains of either fixed or street virus their study is essential.

For estimating virulence MARIE and MUTERMILCH[4] recommend intraspinal inoculations. This admits of the introduction of larger quantities of emulsion, and is apparently more infective. Thus with even day cords which were inoffensive when administered intracorneally, infection occurred in nine out of ten rabbits treated intraspinally.

ANDO and NISHIBE[5] claim that they have invariably observed Negri bodies (smaller in size than the usual, but without internal formations) in rabbits infected with fixed virus.

MANOUELIAN and VIALA[6] refer to RABIAUX' experiments on the infectivity of saliva obtained from a fistula in Wharton's duct, and ascribe the results to lesions in the canal which is lined by epithelial cells, amongst and external to which lie nerve ganglia.

REMLINGER[7] discusses the " neuro-infections mortelles auto-sterilizable " of LEVADITI, SANCHIS BAYARRI and SCHOEN (*C. R. Soc. Biol.*, 1928, xcviii, p. 911), and MARIE and MUTERMILCH (*ibid.*, p. 1314). The condition is that the brains of animals which have been infected with fixed virus, and have died as a result of its action, may give negative results on subpassage. It has been ascribed to a defensive or auto-sterilizing action against the nocuous agent, which operates so intensely as to cause death. REMLINGER is sceptical. He argues that if the process of auto-sterilization occurs at all, it ought to be more apparent in cases in which the duration of sickness is prolonged. Such cases are not rare, and on subpassage the result is usually positive. With regard to the experiments of MARIE and MUTERMILCH, he points out that the virus was introduced into the spinal canal, and that this may favour defensive action. Until more experimental evidence is brought forward he remains sceptical.

Increased interest has been aroused regarding the transmission of the virus along nerve trunks. BOBES[8] describes two cases of rabies

4 MARIE (A. C.) & MUTERMILCH (S.). Note sur la virulence des moelles rabiques. —*C.R. Soc. Biol.* 1928. June 15. Vol. 99. No. 20. pp. 138–140. [1 ref.]

5 ANDO (Keizaburo) & NISHIBE (Masujiro). Ueber die Ursache und den diagnostischen Wert des morphologischen Unterschiedes der Negrischen Körperchen zwischen dem Strassenvirus und dem Virus-fixe.—*Scientific Reports Govt. Inst. Infect. Dis.* Tokyo. 1927. Vol. 6. pp. 205–222. [8 refs.]

6 MANOUÉLIAN (Y.) & VIALA (J.). Neurones virulents et canaux excréteurs des glandes salivaires.—*C.R. Acad. Sci.* 1928. July 9. Vol. 187. No. 2. pp. 151–153. [1 ref.]

7 REMLINGER (P.). La rage peut-elle prendre place parmi les neuro-infections mortelles auto-stérilisables ?—*C.R. Soc. Biol.* 1928. June 15. Vol. 99. No. 20. pp. 118–120. [4 refs.] [Pasteur Inst. of Morocco, Tangier.]

8 BOBES (Sever). Septinévrite rabique chez l'homme, avec mort subite cardiaque.—*C.R. Soc. Biol.* 1928. Oct. 19. Vol. 99. No. 28. pp. 1106–1108. [8 refs.] [Anti-Rabies Inst., Bucharest.]

in which sudden death occurred before the onset of paralyses, and without showing evidence of any pre-existent cardiac lesion. The symptoms resembled those of angina pectoris. He suggests that the virus had become localized in the cardiac ganglia.

Manouelian and Viala[9] have repeated the experiments of Pasteur, Chamberland and Roux (1884) which showed that the pneumogastric nerve may be infective in canine rabies. They have found many lesions containing parasites in the plexiform ganglia, in the neurones which are insinuated between the fibres of the nerve, and in the sympathetic. They ascribe the infectivity of the pneumogastric nerve to the presence of infected neurones amongst its fibres. Remlinger and Bailly,[10] from experiments on dogs with street virus inoculated subdurally, find that in the case of a street virus with an incubation period of 16 days, the virus is present at the point of inoculation, and in the nuclei of the facial nerves on the 9th day (*i.e.*, five days before symptoms declared themselves in the control animals). The virus was more active at the point of inoculation than in the facial nuclei as was shown by the shorter period of incubation in test animals. Nicolau and Galloway (*C. R. Soc. Biol.*, 1928, xcviii, p. 31), had found that emulsions of 26 brachial and sciatic nerve trunks taken from 19 rabbits which had died from a subdural inoculation of street virus, conveyed rabies to 30 out of 30 rabbits, after subdural inoculation (*i.e.*, 100 per cent. success). Somewhat less constant results were obtained by Nicolau and Serbanescu[11] in the case of fixed virus, suggesting that the virus of the street has a greater aptitude for transmission along nerves than has fixed virus. That transmission occurs only along the nerve trunks was confirmed by a further experiment, in which the distal portions of the nerves of one side (the continuity of which had previously been interrupted by operation), were non-infective (10 animals), whereas the corresponding portions of the nerves of the opposite side which had not been divided proved infective in 5 out of 6 rabbits. Nicolau[12] in a further communication extends these results, and finds, from experiments on 48 rabbits killed at various intervals after intracerebral inoculation, that the brachial and sciatic nerve trunks became infective on the 5th day. The observation that positive results were more constant with street than with fixed virus suggests to the author a possible explanation of paralytic accidents. He argues that since immunity to rabies is a tissue immunity, the fixed virus must reach the central nervous system before it becomes operative. In the rare cases where the dispersion of the fixed virus of the vaccine is retarded or prevented, whilst the street virus from the infecting dose is rapidly disseminated it is possible

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9 Manouélian (Y.) & Viala (J.). Cellules nerveuses et virulence du pneumogastrique dans la rage canine.—*C.R. Acad. Sci.* 1928. Oct. 15. Vol. 187. No. 16. pp. 686–687. [2 refs.]

10 Remlinger (P.) & Bailly (J.). Contribution à l'étude de la propagation du virus de rue dans le système nerveux central.—*C.R. Soc. Biol.* 1928. June 8. Vol. 99. No. 19. pp. 14–15. [Pasteur Inst. of Morocco, Tangiers.]

11 Nicolau (S.) & Serbanescu (Virg.). Septinévrite expérimentale à virus rabique fixe dans l'organisme du lapin.—*C.R. Soc. Biol.* 1928. June 29. Vol. 99. No. 22. pp. 294–297. With 2 text figs. [2 refs.] [Pasteur Inst., Paris.]

12 Nicolau (S.). La vitesse de dispersion du virus rabique des rues dans les nerfs périphériques des lapins infectés par voie sous-dure mérienne.—*C.R. Soc. Biol.* 1928. Sept. 18. Vol. 99. No. 26. pp. 677–679. With 1 text fig. [5 refs.] [Pasteur Inst., Paris.]

that a paralytic syndrome might eventuate. (But paralytic accidents occur in the absence of street virus.)

WETHMAR[13] finds that the effect of 1 per cent. carbolic acid on 5 per cent. fixed virus brain emulsion is most potent at a temperature of 20–22° C. After five days virulence is lost. In the ice chest no action was observable.

CUNNINGHAM, NICHOLAS and LAHIRI have continued their experiments on the action of ether. They find from experiments on 81 rabbits,[14] that the virulence of street virus is retained in infected cords for 84 hours but not for 96, and, as this degree of resistance is the same as that of street virus in brain tissue, they conclude that the velocity of action does not depend upon penetrability, but is specific. From experiments on 33 rabbits,[15] they found that the virulence of fixed virus (obtained from the Pasteur Institute of Paris) was retained for 144 but not for 168 hours. (These results are higher than those obtained by REMLINGER and ALIVISATOS.) The Paris strain of fixed virus is thus more resistant than the Kasauli strain. The virulence[16] of a freshly fixed virus of Indian origin was retained for 84 hours but not for 96. This is a lower figure than that given by the French virus or by the ordinary Kasauli strain.

Experiments conducted by GILDEMEISTER and KARMANN[17] on the existence of a cross immunity between rabies and vaccinia have yielded a frank negative. Nine rabbits which had been treated by corneal application of vaccinia virus and subsequently were infected corneally with rabies virus behaved in every respect similarly to nine untreated. Ten treated with "Lyssin" gave no immunity to corneal infection with rabies virus as compared with ten controls. Ten treated with "Lyssin" were not immunized against corneal infection with vaccinia virus, as compared with ten controls.

ii. *Clinical.* A case of rabies is described in the *Long Island Medical Journal*,[18] and Dr. JOHN B. TORRE discusses the possibility of curing the manifested disease. KOLDAJEW[19] has estimated the

13 WETHMAR (Rudolf). Die Einwirkung der Carbolsäure auf das Virus fixe.—*Ztschr. f. Hyg. u. Infektionskr.* 1928. July 3. Vol. 108. No. 4. pp. 802–805. With 1 chart in text. [7 refs.] ["Robert Koch" Inst., Berlin.]

14 CUNNINGHAM (J.), NICHOLAS (M. J.) & LAHIRI (B. N.). An Investigation into the Value of an Etherised Vaccine in the Prophylactic Treatment of Rabies. Part III. The Action of Ether on Street Virus in Infected Cords.—*Indian Jl. Med. Res.* 1928. July. Vol. 16. No. 1. pp. 245–251. [6 refs.]

15 CUNNINGHAM (J.), NICHOLAS (M. J.) & LAHIRI (B. N.). An Investigation into the Value of an Etherised Vaccine in the Prophylactic Treatment of Rabies. Part. IV. The Action of Ether on the Virus Fixe of the Pasteur Institute, Paris.—*Indian Jl. Med. Res.* 1928. July. Vol. 16. No. 1. pp. 253–257. [7 refs.]

16 CUNNINGHAM (J.), NICHOLAS (M. J.) & LAHIRI (B. N.). An Investigation into the Value of an Etherised Vaccine in the Prophylactic Treatment of Rabies. Part V. The Action of Ether on a Freshly Fixed Virus of Indian Origin.—*Indian Jl. Med. Res.* 1928. July. Vol. 16. No. 1. pp. 259–261. [8 refs.]

17 GILDEMEISTER (E.) & KARMANN (P.). Bestehen zwischen Variolavakzine und Lyssa Immunitätsbeziehungen? II. Mitteilung.—*Cent. f. Bakt.* I. Abt. Orig. 1928. Aug. 21. Vol. 108. No. 5–6. pp. 254–258. [Reichs Health Office, Berlin-Dahlem.]

18 LONG ISLAND MEDICAL JOURNAL. 1928. Mar. Vol. 22. No. 3. pp. 162–164. Case Report from the Staff Conference of the Kings County Hospital. Rabies.

19 KOLDAJEW (B.). Ueber Glykämie bei experimenteller Wutkrankheit.—*Deut. Tierärtz. Woch.* 1928. June 2. Vol. 36. No. 22. pp. 384–385. [8 refs.] [Bact. Inst., Kiev.]

blood sugar of 20 rabbits infected with fixed virus, by the Hagedorn-Jensen test. During the incubation period he has observed no change. The slight increase which occurs with the commencement of symptoms is to be explained as secondary to a rise in temperature. In the last stages of the disease a more definite increase was observed in half of the rabbits examined. After death the blood sugar was increased in two-thirds of the cases, as were also reducing substances in the urine. He considers that the hyperglycaemia is the result of injury to the floor of the 4th ventricle by the advancing process of infection.

iii. *Pathological.* Lowenberg[20] describes the pathological changes observed in the nervous systems of four cases of human rabies. Inflammatory lesions were observed in the substantia nigra and grisea, and sometimes in the meninges. The lesions were similar to those found in encephalitis lethargica. The pigmented centres of the substantia nigra showed neuronophagia, with phagocytosis of pigment by the neuroglia. The shorter the incubation period the more definite was the inflammatory process. Degenerations, on the other hand, were localized chiefly in the cortex and in the basal ganglia. In one case meningitic changes were prominent, and in another a purulent inflammatory process was observed chiefly in the grey nuclei of the pons and the substantia nigra. The latter case was one of short incubation (19 days).

Lenci and Esquivel[21] state that in canine rabies, especially in its paralytic form, the spleen is hypertrophied, and shows subcapsular haemorrhages. In six normal dogs the spleen was found to weigh 2·04 gm. per kilo of live weight. In eight rabid dogs the weight rose to 3·91 gm. per kilo. The authors consider that this enlargement was not due to intercurrent infection, as both aerobic and anaerobic cultures were sterile, but to an elective process of vaso-dilatation of nervous origin. They consider the condition to be of diagnostic value.

Serra[22] describes structural changes in the myocardia of animals infected with rabies virus. They are of the nature of an acute interstitial and parenchymatous myocarditis, and are more definite in animals inoculated with fixed than with street virus. The parenchymatous changes are degenerative in character, leading ultimately to atrophy of the muscle cells.

Takaya,[23] in his 6th report on rabies in rabbits, describes the well known changes in the corpuscular ratios, and Massias[24] contributes observations on the blood picture of a child who died of rabies, but had not received treatment. The blood was examined one day before and one hour before death, and gave the same differential count in

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20 Lowenberg (Konstantin). Rabies in Man: Microscopic Observations.—*Arch. Neurol. & Psychiatry.* 1928. Apr. Vol. 19. No. 4. pp. 638–646. With 4 text figs. [2 refs.]

21 Lenci (Pedro) & Esquivel (Ricardo). Sobre una lesión no descripta en la rabia canina (esplenomegalia hemorrágica).—*Semana Méd.* 1928. June 21. Vol. 35. No. 25 (1797). pp. 1553–1555.

22 Serra (Antonio). Lesioni miocardiche nella rabbia.—*Clin. Vet.* 1928. July. Vol. 51. No. 7. pp. 408–414. With 3 figs. on 1 plate. [Royal Inst. Veter. Med., Turin.]

23 Takaya (J.). [The Experimental Studies of Rabies in Rabbits. Sixth Report.—*Oriental Jl. Dis. Infants.* 1928. July. Vol. 4. No. 1. [In Japanese. English summary p. 4.] [Children's Clinic, Imperial Univ., Kyoto.]

24 Massias (Charles). Rage suraiguë non traitée préventivement. Etude cytologique du sang.—*C.R. Soc. Biol.* 1928. June 29. Vol. 99. No. 22. pp. 319–320. [1 ref.]

each case. Polymorphonuclears 85, lymphocytes 14, monocytes 0·9, eosinophiles and basophiles both zero. The figure obtained by the Arneth method was 296 (for 100 cells), *i.e.*, a deviation towards the right.

From an examination of the sera of rabbits, HOTTA,[25] using cooked antigen and glycerine extract, considers that complement deviation is of no diagnostic value.

iv. *Methods of Treatment.* LEGEZYNSKI and WEISSBROD[26] compare the immunizing effects of various methods of treatment upon 6 batches of 6 white rats, and obtain inconclusive results. KONIEFF and RAMSINE[27] similarly have treated 7 batches of varying numbers of rabbits (in all 26 rabbits) by seven modifications, and conclude from rather indefinite evidence that formolized and etherized vaccines are as potent as fresh. AUJESZKY,[28] from experiments on some thirty rabbits, finds that the Budapest strain of fixed virus, prepared according to the method of UMENO and DOI, loses virulence in four weeks at room temperature. Vaccine prepared according to the method of KONDO, is inoffensive after keeping for 3 days at 37°, but if kept at room temperature virulence may be maintained for 28 days. Again LEGEZYNSKI and MARKOWSKI[29] find that of 9 dogs and 2 rabbits treated with Fermi's vaccine, one died of rabies after a test dose of street virus, whilst of 4 control rabbits none developed the disease.

VALLEE reviews BAILLY'S work[30] on ether vaccines (Remlinger) to which reference has previously been made. In an interesting paper, VOLPINO and FINOCCHIO[31] describe experiments on the immunizing properties of nucleo-proteids extracted from rabies brains. The method of extraction was as follows. Fixed virus rabbit brains were rubbed into a paste in a mortar. Ether was added and after a period of 4 hours, the emulsion was strained. The sediment so obtained was treated with a 1 per cent. solution of sodium hydrate, and shaken for from 4 to 6 hours. The limpid opalescent supernatant fluid was decanted, and precipitated with acetic acid. After standing for some hours, the precipitate was separated, and suspended in physiological saline containing 0·25 per cent. carbolic. The acid was neutralized with a few drops of soda solution. The resulting suspension was innocuous to rabbits, causing no local reaction nor pain. To test its

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25 HOTTA (Tùkitaka). Zur Diagnose der Lyssa mittels Komplementablenkung. —*Wien. Klin. Woch.* 1928. Nov. 1. Vol. 41. No. 44. pp. 1513–1514. [Federated States Anti-Rabies Inoculation Inst., Vienna.]

26 LEGEZYNSKI (Stanislas) & WEISSBROD (Bronislas). Recherches expérimentales sur l' immunisation non spécifique contre la rage.—*C.R. Soc. Biol.* 1928. Sept. 18. Vol. 99. No. 26. pp. 918–919. [1 ref.]

27 KONIEFF (D.) & RAMSINE (S.). Essais sur la vaccination contre la rage par le formol-vaccin.—*C.R. Soc. Biol.* 1928. Oct. 26. Vol. 99. No. 29. pp. 1259–1261. [1 ref.]

28 AUJESZKY (A.). Ueber die Virulenz des Virus fixe in den karbolisierten Impfstoffen.—*Cent. f. Bakt.* I. Abt. Orig. 1928. June 20. Vol. 107. No. 6/7. pp. 358–361. [16 refs.] [Royal Hungarian Veter. High School, Budapest.]

29 LEGEZYNSKI (Stanislas) & MARKOWSKI (Sigismond). Recherches expérimentales sur la vaccination antirabique curative des chiens.—*C.R. Soc. Biol.* 1928. Sept. 18. Vol. 99. No. 26. p. 916.

30 BAILLY. Pratique de la vaccination des animaux contre la rage au moyen du virus-éther (méthode de Remlinger).—*Bull. Acad. Vét. de France.* 1928. May. Vol. 1. pp. 180–183. [1 ref.]

31 VOLPINO (G.) & FINOCCHIO (M.). Sul potere vaccinante del nucleo-proteide nervoso nella rabbia.—*Riforma Med.* 1928. Sept. 17. Vol. 44. No. 38. pp. 1205–1206. [Hyg. Inst., Univ., Messina.]

immunizing properties, six rabbits were given the equivalent of 5 gm. of nerve substance over a period of 3 or 4 consecutive days. After 15 days a test dose of 1 cc. of fresh fixed virus was administered to these, and to six untreated control rabbits. Of the controls 5 out of 6 developed rabies, whilst of the treated none were affected. The surviving animals were not refractory to massive doses of fixed virus given at a later date. A second experiment confirmed these conclusions.

Remlinger and Bailly[32] extend their observations on local immunization (this *Bulletin*, Vol. 25, p. 711). They argue that as the rabies virus is neurotropic, evidence of local immunity should be looked for in the nervous system. They refer to Marie and Mutermilch's observation that rabbits vaccinated by the meningeal route with ether vaccine became refractory to intracerebral inoculation of fixed virus (*loc. cit*,, p. 709). In attempting to confirm these experiments the authors treated 19 rabbits intracerebrally with desiccated vaccine, and 17 with ether vaccine on from 3 to 6 occasions. The test dose of fixed or street virus, was introduced into the vaccinated, or the unvaccinated hemisphere. All the animals succumbed with the same incubation as that of the controls. There was no evidence of the least trace of immunity. They point out that their experiments differ from those of Marie and Mutermilch in that in the former, treatment was intracerebral, whilst in the latter treatment was presented by the meningeal path. Sanchis Bayarri[33] has however failed to demonstrate immunity in 12 animals treated with ether and formol vaccines by the meningeal route.

Puntoni[34] joins in the discussion regarding treatment by carbolized vaccines to which I referred in my last report (this *Bulletin* Vol. 25, p. 711, references 31 and 32.)

v. *Statistics.*

Viala[35] reports that of 639 persons treated at the Pasteur Institute of *Paris* during the year 1927 none developed rabies. Amongst 1,142 persons treated at Shillong[36] (Assam) during 1927, rabies developed in 11 persons, or 0·61 per cent. of the total. The percentage of cases in which there was no visible lesion was 0·61, and the percentage of individuals who commenced treatment later than the first week was 36. Da Veiga[37] reported that at the Pasteur Institute of *Rio de Janeiro* 1,766 persons were fully treated during the year 1927–28.

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32 Remlinger (P.) & Bailly (J.). La vaccination locale dans la rage ; échec de la vaccination intracérébrale. (Deuxième mémoire.)—*Ann. Inst. Pasteur*. 1928. July. Vol. 42. No. 7. pp. 736–741. [5 refs.]

33 Sanchis-Bayarri (V.). Ensayos de vacunación antirrábica del conejo por via meningea.—*Rev. Méd. de Barcelona*. 1928. Sept. Year 5. Vol. 10. No. 57. pp. 247–252. [9 refs.]

34 Puntoni (Vittorio). Los distintos métodos en uso, de las vacunas antirrábicas fenicadas.—*Semana Méd.* 1928. July 26. Vol. 35. No. 30. pp. 239–241.

35 Viala (Jules). Les vaccinations antirabiques à l'Institut Pasteur en 1927.—*Ann. Inst. Pasteur*. 1928. June. Vol. 42. No. 6. pp. 724–728.

36 Assam. King Edward VII Memorial Pasteur Institute and Medical Research Institute, Shillong. The Eleventh Annual Report for the Year ending 31 December 1927. [Morison (J.), Director.]—27 pp. 1928. Shillong : Govt. Press. [1s. 3d. ; 13 annas.]

37 da Veiga (Octavio A.). Prophylaxia da raiva no Rio de Janeiro.—*Folha Med.* 1928. Oct. 15. Vol. 9. No. 29. pp. 42–43.

Of these two were classified as failures. At the *New Orleans* (U.S.A.) Charity Hospital 1,871 persons were treated from 1920 to 1926 (HAUSER[38]) by the method of Harris. In 3 or 4 cases symptoms of paralysis were observed. From *Kasauli* (India) CUNNINGHAM[39] reports that during the year 1926, 6,138 persons were treated at the Pasteur Institute and 2,234 at out-stations. The death rate amongst the former was 1·76 per cent. and amongst the latter it was 1·29. These figures are higher than those of former years. This apparent increase in death rate is due to the introduction of a rigorous method of following up cases for six months after completion of treatment, in accordance with the recommendation of the International Conference. Definite information has been received as to 80 per cent. of the treated. The investigation into the efficacy of etherized vaccines is being steadily prosecuted, but results are not as yet available. The percentage with no visible lesions of Indians treated at Kasauli was 1·54.

vi. *Paralytic Accidents.*

Two cases of paralytic accident which followed treatment with vaccine killed by carbolic acid are reported. The first by ALESSANDRINI[40] from Aquila, one of the dispensaries supplied by PUNTONI. The symptoms persisted for about six months, and involved the whole trunk. The second is discussed by STUART and KRIKORIAN[41] (Jerusalem), and occurred after treatment by Semple's vaccine. In this case symptoms involved the leg, the bladder and the rectum, and recovery followed after about a month. STUART and KRIKORIAN have examined the general question of causation. Although they have succeeded in inducing the symptoms and post mortem appearances of anaphylactic shock in rabbits as a result of the action of foreign nerve material, they consider that paralytic accidents are not related to anaphylaxis. They have succeeded in inducing paralysis in 2 out of 15 rabbits inoculated with 280–672 mgm. sheep's brain substance in normal saline, but not in 15 treated with sheep's brain which had been carbolized. From these and other experiments they have been unable to demonstrate any relation between occurrence of paralysis and elevation of dosage. To find whether homologous brain substance had the same effect as heterologous, they treated 40 rabbits with fixed virus brain (rabbit) in saline ; and 40 with the same nervous material in carbol saline solution. Of the former group one developed paralysis, of the latter none became paralysed. From their various experiments they conclude that, though normal brain material may induce anaphylactic

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38 HAUSER (George H.). Rabies and its Preventative Treatment.—*New Orleans Med. & Surg. Jl.* 1928. June. Vol. 80. No. 12. pp. 794–804. [27 refs.] [Charity Hosp., New Orleans, La.]

39 KASAULI. PASTEUR INSTITUTE OF INDIA. The Twenty-Sixth Annual Report of the Central Committee of the Association and the Audited Accounts up to June 30th, 1927, also the Report of the Director of the Institute for the Year ending 31st December 1926. Part II. [CUNNINGHAM (J.), Director.]—60 pp. Simla : Liddell's Printing Works.

40 ALESSANDRINI (Alessandro). Un caso di paralisi acuta da vaccinazione antirabica con vaccini fenicati a virus ucciso.—*Ann. d. 'Igiene.* 1928. July. Vol. 38. No. 7. pp. 550–554. [6 refs.] [Anti-Rabies Dispensary, Prov. of Rieti. (Anti-Rabies Inst., Rome.)]

41 STUART (G.) & KRIKORIAN (K. S.). The Neuro-Paralytic Accidents of Anti-Rabies Treatment.—*Ann. Trop. Med. & Parasit.* 1928. Nov. 9. Vol. 22. No. 3. pp. 327–377. [56 refs.]

shock, paralytic symptoms are not an anaphylactic phenomenon: paralyses are not due to fixed virus or to rabies toxin; accidents follow the exhibition of brain substance whether normal or rabid; they are equally induced by homologous and heterologous nerve substance: the cause lies in some constituent of normal brain substance which is rendered innocuous by the action of 1 per cent. phenol. The actual occurrence of accident is governed by predisposition or idiosyncrasy.*

Van den Hoven van Genderen[42] discusses the accidents which occurred during the period 1896–1908 by the Rumanian method (Piscariu). She points out that these vaccines were not dead, and supports this by experiments showing that emulsions heated for 15 minutes at 50°–65° are still virulent. During the period 1896–1908 the dosage was high and the proportion of accidents was 1 in 260. After 1908 though the periods of heating were altered the dosage was reduced to one tenth and accidents ceased. She concludes that the high dosage and not the effect of heating was the important factor in inducing paralyses. She holds strongly to the view that there is a definite relation between the prevalence of accidents and high dosage of fixed virus.

Three papers deal with Quast's contention that fixed virus may be found in the brains of individuals who have been killed or have died from intercurrent causes, during or after treatment with a live virus. David[43] has obtained negative results in the case of the brains of 5 dogs and 8 guineapigs which had been treated with a single dose of 1 to 2 gm. of living virus, and were killed eight months later. Remlinger and Bailly[44] in five series of experiments on some 33 animals, which had received large doses of fixed virus, obtained consistently negative results. Two of these animals, a dog and an ass, had received doses amounting to 25, and 9 rabbit brains respectively. Van den Hoven van Genderen and Dik[45] add the results of experiments on monkeys, 3 of which received a series of doses amounting in each case to 161 mgm, 3 received 212 mgm., 4 received 325 mgm., and 4 received 1,019 mgm. Of 108 guineapigs inoculated with the brains of these monkeys, killed at periods of from 1 to 6 days after completion of treatment, none developed rabies.

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* In this paper the reviewer is referred to as having upheld the anaphylactic origin of paralytic accidents at the International Conference, the statement being based upon Remlinger's official summary. A correction is necessary. I said that in 1907 Harvey and I put forward the view that these accidents were due in some way to normal brain substance, and might be an anaphylactic phenomenon. I added that in the light of recent experiments this explanation was inadequate. A. G. McK.

42 van den Hoven van Genderen (Jeanne). Die erwärmten Virus fixe-Emulsionen von Puscariu und die danach aufgetretenen Lägmungen.—*Cent. f. Bakt.* I. Abt. Orig. 1928. Sept. 26. Vol. 108. No. 7/8. pp. 430–432. [1 ref.] [Pasteur Inst., Bandoeng, Java.]

43 David (Hans). Ueber das Vorkommen von Wutvirus im Gehirn schutzgeimpfter gesunder Tiere. I. Mitteilung.—*Cent. f. Bakt.* I. Abt. Orig. 1928. July 25. Vol. 108. No. 1/4. pp. 49–52. [9 refs.] [Veter. High School, Vienna.]

44 Remlinger (P.) & Bailly (J.). Le virus fixe ne passe pas dans le système nerveux central au cours du traitement antirabique.—*Ann. Inst. Pasteur.* 1928. July. Vol. 42. No. 7. pp. 729–735. [6 refs.]

45 van den Hoven van Genderen (Jeanne) & Dik (J. H.). Zur Frage des Vorkommens von Virus fixe im Gehirn bei der Antirabtesbehandlung.—*Cent. f. Bakt.* I. Abt. Orig. 1928. July 25. Vol. 108. No. 1/4. pp. 52–57. [3 refs.] [Pasteur Inst., Bandoeng, Java.]

vii. *Rabies in Animals.*

Aujeszky[46] reports from Hungary that during the last 25 years 9,328 animals were vaccinated against rabies by the method of Högyes, of which 184 (2 per cent.) developed the disease.

Miessner and Baars[47] criticise Herrmann's article on obligatory protection of dogs (this *Bulletin*, Vol. 25, p. 714), in which he stated that a single dose of fixed virus, as large as it is safe to administer without running undue risk of conveying infection, fails to give adequate protection. Using " Lyssin " on 81 dogs, none, in the author's hands, developed inoculation rabies. A discussion[48] on the vaccination of dogs, opened by Dr. Stimson, is reported in the United States Public Health Bulletin. Bailly[49] discusses treatment of animals by ether vaccine, and advocates its use.

viii. *Miscellaneous.*

Herrmann[50] from the examination of the brain of the *foetus in utero* in various cases, human and other, finds that the virus of rabies can be transmitted through the placenta. The virus so obtained is somewhat reduced in virulence. He also found[51] that the saliva of a boy who developed rabies during treatment was infective.

Legezynski and Markowski[52] discuss the possible existence of rabies carriers. Of 6 dogs which proved refractory to a test dose of street virus after treatment with Fermi's vaccine were killed four months after completion of treatment. Rabbits were inoculated with brain, pancreas, and salivary glands, but none developed rabies ; *i.e.*, none of the dogs were carriers.

Di Vestea[53] refers to the classic experiments by which he with Zigara (1886–1890) demonstrated the propagation of the virus along the nerve trunks. In 1894 he described corpuscles in nerve fibres which are not essentially different from Negri bodies. In these days he arrived at the view that the parasite of rabies existed in nature in two phases.

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46 Aujeszky (A.) [Données statistiques sur la vaccination antirabique en Hongrie.]—*Allat. Lapok.* 1926. No. 22. p. 283. [Summarized in *Bull. Inst. Pasteur.* 1928. Oct. 31. Vol. 26. No. 20. p. 926.]

47 Miessner (H.) & Baars (G.) Entgegnung zu dem Artikel von Dr. Otto Herrmann " Ueber einmalige obligatorische Schutzimpfung der Hunde gegen Tollwut."—*Cent. f. Bakt.* I. Abt. Orig. 1928. Sept. 26. Vol. 108. No. 7/8. pp. 433–437. [2 refs.]

48 Transactions of the 24th Annual Conference of State and Territorial Health Officers with the United States Public Health Service. Vaccination of Dogs against Rabies.—*U.S. Public Health Bull. No.* 167. 1927. Feb. pp. 63–76.

49 Bailly (J.). [Contribution à l'étude de la vaccination antirabique des animaux domestiques. Emploi du virus-ether.]—*Thèse Doct. vétér.* Lyon. 1928. June. 73 pp. Impr. Bosc et Riou. [Summarized in *Bull. Inst. Pasteur.* 1928. Oct. 31. Vol. 26. No. 20. pp. 928–929.]

50 Herrmann (Otto). Plazentare Uebertragung der Wut.—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1928. Vol. 58. No. 3/4. pp. 371-383. [18 refs.] [Kasan State Inst. for Med. Advancement, Kasan.]

51 Herrmann (Otto). Lyssavirus im menschlichen Speichel.—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1928. Vol. 58. No. 3/4. pp. 384–388. [16 refs.] [Kasan State Inst. for Med. Research, Kasan.]

52 Legezynski (Stanislas) & Markowski (Sigismond). Recherches expérimentales sur les porteurs éventuels de germes rabiques.—*C. R. Soc. Biol.* 1928. Sept. 18. Vol. 99. No. 26. p. 917. [1 ref.]

53 di Vestea (Alfonso). [Neurotropismo del virus rabido e sua probabile natura protozoaria a duplice fase di vita.]—*Ann. d. Univ. Toscane.* Vol. 11. No. 2. With 1 fig. [Summarized in *Bull. Inst. Pasteur.* 1928. July 15. Vol. 26. No. 13. p. 602.]

Hay[54] describes an epidemic of rabies in Kingston District of the province of Ontario (Canada) which occurred in February 1928. The number of persons bitten was 50; all were successfully treated by Semple's vaccine. Canada was free from rabies from 1917–1925. In the latter year an outbreak occurred in the Ottawa district. During 1926 cases were reported from Russell, Dundas, Lanark, Renfrew, Granville and Leeds counties, and in 1927 a further outbreak appeared in the Sharbot Lake district of the County of Frontenac.

A series of instructional articles[55] by Rosenau, Frothingham, Dailey, Bigelow, and Cummings are collected in "Commonhealth." The first of these[56] by Rosenau is repeated in another periodical. Another instructional article appears in the United States Naval Medical Bulletin[57].

Narayanan[58] reviews methods of control of rabies, and refers in particular to measures adopted in Kedah (Malay States).

In the course of a general summary of methods of treatment, Pardo[59] makes the interesting statement that at the end of the eighteenth century "Eusebio Valli a Tuscan practitioner was the first to conceive of vaccination against rabies by the inoculation of virus attenuated by the addition of gastric juice." No reference is given. It would be interesting to know the historical source of this assertion since so far as I am aware it has not been previously noticed.

A. G. McKendrick.

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54 Hay (W. D.). A Note on the Outbreak of Rabies in the Kingston District.—*Canadian Med. Assoc. Jl.* 1928. July. Vol. 19. No. 1. p. 73.

55 Commonhealth. Massachusetts. 1928. Apr.–May–June. Vol. 15. No. 2. pp. 27–44.—[Rabies.] [4 refs.]

56 Rosenau (M. J.). Rabies. The Treatment of Wounds and Prevention of the Disease.—*New England Jl. of Med.* formerly *Boston Med. & Surg. Jl.* 1928. May 31. Vol. 198. No. 15. pp. 787–791. [4 refs.]

57 United States Naval Medical Bulletin. 1928. July. Vol. 26. No. 3. pp. 681–684.—Rabies and Antirabic Treatment.

58 Narayanan (R. S.). Rabies in Kedah. (A Résumé of Measures pursued.) —*Indian Vet. Jl.* 1928. Vol. 5. No. 1. pp. 29–40.

59 Perez Pardo (J.). Estado actual del tratamiento antirrábico en el hombre. —*Med. Países Cálidos.* Madrid. 1928. May. Vol. 1. No. 3. pp. 209–223. [15 refs.]

MEDICAL ZOOLOGY.

Mathewossian (Sch. T.). Untersuchung der Bevölkerung des Rayons von Idjewan (Armenien, Transkaukasien) auf Darmprotozoen. [**Intestinal Protozoa of Population of an Armenian District.**]—*Arch. f. Schiffs -u. Trop.-Hyg.* 1928. June. Vol. 32. No. 6. pp. 320–324. [Trop. Inst., Erivan, Armenia U. S. S. R.]

This paper gives the results of a 24 days' survey of the stools of 692 individual inhabitants of a group of 12 villages in Armenia and Transcaucasia. Protozoa were found in 65·9 per cent. of them, of the following species in their several percentages :—*Entamoeba histolytica*, 17·7 ; *E. coli*, 32·0 ; *Endolimax nana*, 17·5 ; *Iodamoeba buetschlii*, 14·3 ; (*Dientamocba fragilis* in one case only). *Giardia intestinalis*, 14·5 ; *Trichomonas intestinalis*, 15·0 ; *Chilomastix mesnili*, 7·0 ; *Balantidium coli*, 1·6 ; ("*B. minutum*" one case).

A. Alcock.

Svensson (Ruth M.). **A Survey of Human Intestinal Protozoa in Sweden and Finland. (A Preliminary Report.)**—*Parasitology.* 1928. Oct. Vol. 20. No. 3. pp. 237–249. [18 refs.]

Records of a one-examination survey of intestinal protozoa of 2,014 persons, of whom all but 159 were hospital and mental asylum cases in Sweden. The asylum cases had the higher incidence of infestation ; and male patients a higher incidence than the females ; and the country-people than the residents of Stockholm. The species observed were *Entamoeba histolytica* in 140 cases, *E. coli* in 618, *Endolimax nana* in 368, *Iodamoeba buetschlii* in 131, *Dientamoeba fragilis* in 16, *Giardia intestinalis* in 92, *Chilomastix mesnili* in 267 (the incidence being very high in asylums), *Trichomonas hominis* in 10, other flagellates in 14, *Balantidium coli* in 3.

A. A.

Iriarte (David R.). Estadistica coprológica del Laboratorio del Hospital Vargas. [**Coprological Statistics of the Laboratory of the Hospital.**]—*Rev. Med. y Cirug.* Caracas. 1928. Apr. Vol. 11. No. 116. pp. 312–314.

The statistics are for a term of six months, during which analyses of 1,123 samples were made, and they are expressed in percentages month by month, from May to October. The following forms were observed and the maximum and minimum monthly percentages of each are abstracted. *Entamoeba histolytica*, 7·1 to 4·0 ; *Balantidium coli*, 0·5 to 0 ; flagellates (Trichomonas, Chilomastix, Enteromonas, Giardia), 12·0 to 5·4 ; Ascaris, 24·1 to 9·3 ; Trichocephalus 28·4 to 18·2 ; "Anguillula," 7·1 to 2·8 ; *Necator americanus*, 33·3 to 11·5 ; *Bilharzia mansoni*, 6·3 to 2·6; *Hymenolepis nana*, 0·5 to 0 ; Blastocystis, 5·8 to 2·3 ; Fungi, 9·3 to 3·8 ; Spirochaetes, 2·9 to 0 ; Charcot-Leyden crystals, 2·8 to 0.

A.A.

SMITHIES (Frank). **Parasitosis of the Bile Passages and Gall Bladder. A Report upon 37 Instances of Protozoiasis and One Instance of Infestation by** *Necator americanus.*—*Amer. Jl. Med. Sci.* 1928. Aug. Vol. 176. No. 2. pp. 225–253. [32 refs.]

The author refers to his first discovery (1917) of active *Giardia intestinalis* in a gall-bladder removed by surgery. The present report deals very fully with 37 instances of protozoon infestation of the bile-tract among 1,591 patients examined. Each drainage was continued on an average more than five hours, after " metapyloric instillation " of solution (33 per cent.) of magnesium sulphate ; in 16 cases parasites were not discovered at the first drainage operation, and in one instance not until the fifth. In the majority of cases—but not in all—the patients' stools contained cysts. The fact that in some cases protozoa are not found prior to drainage of the bile-tract (following stimulation of the duodenum by magnesium sulphate) is regarded as evidence that the protozoa discovered by this method were resident *in* the bile-tract ; but the author also refers to 8 instances where subsequent to the discovery of protozoa by drainage, their presence in the gall-bladder was finally verified in the contents of the organ after excision. The species observed in these 37 instances were *Chilomastix mesnili* in 25, *Entamoeba histolytica* in 5, Trichomonas in 6, *E. coli* and Giardia in 2 each. All the 37 patients harbouring protozoa in the bile-tract were ill, the usual condition being chronic bilious dyspepsia, or colitis with some sort of derangement or discomfort in the motions of the bowel. The eosinophil ratio was often affected, the average percentage being 4·1. The details of the clinical and laboratory observations in relation to the particular parasite infestation are given for each case, in a valuable table, along with duration and results of individual treatment.

Locomotion of the parasites within the alimentary tract, in respect of local infestation and re-infestation, is discussed, the author being of opinion that although three-fourths of the patients were deficient in " normal " gastric acidity yet the deterrent influence of gastric acidity has been much overrated. His observations show that not only cysts of protozoa, but active forms also can resist the acidity of the stomach. Where acidity reached 38 *E. histolytica* was not found. The question of the influence of climate upon pathogenous behaviour is discussed; 18 of the 37 patients were born and bred in the south (" Southern immunes "), and it was estimated from their histories that some must have harboured protozoa many years before they suffered from dyspepsia. Medical (non-surgical) treatment is discussed. Sixty per cent. of the cases treated medically and by drainage recurred, sometimes as many as three times.

A. A.

SMITHIES (Frank). **Present-Day Treatment of Intestinal Protozoiasis and Factors that determine its Efficacy.**—*Jl. Amer. Med. Assoc.* 1928. July 21. Vol. 91. No. 3. pp. 152–157. [13 refs.]

This is a general review of the subject of intestinal infestation by pathogenous protozoa. The author contrasts the urgent and acute results of such infestation in the tropics with the obscurer and more chronic effects usually occurring in non-tropical countries—the latter being, in the main, the aspect that has come within his own personal

observation. The greater part of the paper is devoted to the clinical management of such chronic infection, and the value of the paper depends not on any novel range of facts or principle but on eclectic detail in the therapeutic sphere, which cannot be condensed.

A. A.

Hegner (Robert). **The Evolutionary Significance of the Protozoan Parasites of Monkeys and Man.**—*Quarterly Rev. Biol.* 1928. June. Vol. 3. No. 2. pp. 225–244. With 19 text figs. [91 refs.] [Johns Hopkins Univ. School of Hygiene, Baltimore, Md.]

This paper illustrates not the disagreeable practical applications of parasitology but one of the many pleasing philosophic applications of that subject. The author enumerates and reviews in individual detail the species of protozoa parasites of man and of monkeys, and in comparing the two catalogues he draws attention to the large proportion of valid species that (ignoring mere whims of a rather crude nomenclature) seem to be common to both. Such close correspondences, he notes, are not found when the protozoan parasites of man are compared with those of any other mammals whose parasitic fauna has been studied. He concludes, with a somewhat antiquated reserve, that if the theory be valid that where two different species of hosts harbour closely-related parasites those two hosts must have a common ancestry, then the data reviewed in this paper furnish important evidence " in favour of the hypothesis that monkeys and man are of common descent."

A. A.

Kessel (John F.). **Intestinal Protozoa of Monkeys.**—*Univ. California Public. Zool.* 1928. Aug. 11. Vol. 31. No. 13. pp. 275–306. With 24 figs. on 2 plates. [54 refs.]

Entamoba dysenteriae [*histolytica*], *E. coli*, *Endolimax nana*, *Iodamoeba buetschlii*, *Councilmania lafleuri*, *Giardia lamblia*, *Trichomonas hominis*, *Chilomastix mesnili*, and *Embadomonas intestinalis*, in every case structurally indistinguishable from the forms found in the human intestine, have been recognized by the author in four species of Macacus monkeys, and, with the exception of Giardia and Councilmania, have been cultivated in the egg-serum medium in which those Protozoa have been cultivated from man. Excystment of Nos. 1, 3, 4, and 8, and encystment of Nos. 1 and 2, were observed in culture from the monkey. Monkeys were experimentally infected with Nos. 1, 2, 3, 7, and 8 from man. *E. dysenteriae* of monkeys invaded the mucosa muscularis, submucosa, and lymphatic nodules of the intestine of monkeys. Kittens were experimentally infected with *E. dysenteriae* of monkeys, both by cysts and trophozoites, per anum, and the ensuing symptoms were similar to those that follow infection of kittens with *E. dysenteriae* of man. The author therefore concludes that the forms of the above-specified Protozoa found in monkeys are conspecific with those found in man. And he also emphasizes the conclusion that the monkey should prove a very suitable animal for the experimental study of amoebiasis.

A. A.

KESSEL (John F.). **Intestinal Protozoa of the Domestic Pig.**—*Amer. Jl. Trop. Med.* 1928. Sept. Vol. 8. No. 5. pp. 481–501. With 28 figs. on 2 plates. [13 refs.]

The intestinal protozoa here discussed were the issue of 160 samples of faex from as many pigs brought to market in Pekin. The species found were *Balantidium coli* ; *Entamoeba polecki* of Prowazek (=*suis* of Hartmann and *debliecki* of Nieschulz) in 39 per cent.; Iodamoeba in 42 per cent. and Trichomonas, both of them indistinguishable from the species occurring in man ; and four species resembling and probably identical with the *Entamoeba dysenteriae* and *coli*, the *Endolimax nana*, and the *Chilomastix mesnili* of man—the first of these four in 20 per cent., the second in a single pig, the third in 14 per cent., and the last in 4·6 per cent.

Pigs fed (with all experimental precautions) on material containing the following cysts became correspondingly infected—*E. dysenteriae* of man and of monkey, *E. coli* of man, *E. nana* of man, and *Chilomastix mesnili* of man.

A. A.

CURRAN (J. A.). **Experiments with the Use of Carmine Stains for the Detection and Differentiation of Intestinal Protozoa.**—*Amer. Jl. Trop. Med.* 1928. July. Vol. 8. No. 4. pp. 353–362. [5 refs.] [Peking Union Med. College., Peking.]

This paper, which reviews classical methods of staining intestinal amoebae and records experiments in staining cysts and trophozoites with carmine, cannot be condensed. It describes the technique of deep staining with Harris haematoxylin and Best's carmine as giving the best results of all the methods tried. This method is said to take 91 minutes.

A. A.

BRUMPT (E.). **Differentiation of the Human Intestinal Amoebae with Four-Nucleated Cysts.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1928. Aug. 22. Vol. 22. No. 2. pp. 101–114. [Parasit. Lab., Faculty of Med., Paris.]

Brumpt gives a very simple explanation of the proposition that although indigenous carriers of quadrinucleate amoeba-cysts are numerous in every country where they have been looked for, amoebiasis as a pathological process seems to originate almost entirely in the warmer regions of the globe. According to him the quadrinucleate cysts are of 3 species, only one of which, *E. dysenteriae*, limited to the countries where liver-abscess is endemic, is pathogenous for man. The other two species, found all the world over, are non-sanguivorous and non-pathogenous . Of these *E. dispar*, the commoner, is a *minuta*-form amoeba, having cysts " quite comparable to " *E. dysenteriae* and only to be distinguished by the results of inoculation into kittens. In *E. dispar* infection, if the kittens die there will be found at most only sparse microscopic patches of superficial congestion of the intestinal mucosa, without any thickening of the intestinal wall ; but it is more likely that they will recover, after a short-lived infection with amoebae in whose cytoplasm red corpuscles are rarely observed. The other non-pathogenous species, *E. hartmanni*, is even smaller than the *minuta*

form of *E. dysenteriae* and its cyst can be distinguished both from *E. dysenteriae* and from *E. dispar* by the more voluminous siderophile masses in the cytoplasm. According to Brumpt amoebic dysentery occurring in Western Europe [i.e. outside the endemic area of *E. dysenteriae*] must be attributed to contamination from some one who has lived in hot countries where dysentery is endemic.

Warrington YORKE expressed his dissent from this "very simple explanation of a very puzzling phenomenon," and referred to reported experiments of his own, when he had inoculated kittens with faeces from cases of indigenous dysentery in British youths of 18 or 19 years, with results to some of the kittens that were not distinguishable from those produced in similar experiments with the excreta of chronic dysenterics from abroad. Of course, since these youths (recruits) were in a camp in which there were people who had returned from France and from the East, it could be demurred that they had been contaminated from abroad—but that line of argument did not obviate difficulties. He also referred to long-continued observations by ADAMS and himself showing that cysts of *E. dysenteriae* passed even by the same individual at different times differed very markedly in certain important respects; and he also mentioned a case of a patient who constantly passed one-nucleated cysts (except on one occasion when a single binucleated cyst was seen) apparently all dead and indicative of conditions in that individual's gut inimical to the *histolytica* type of cyst.

Lyndhurst DUKE, as a unicist, pointed to the analogy of *Trypanosoma gambiense, rhodesiense,* and *brucei*. J. G. THOMSON's studies had brought him to the conclusion that indigenous carriers of *E. histolytica* cysts in England and America were a potential danger to the community, and he alluded to certain circumstances influencing pathogenous issues—e.g. alteration of virulence by rate of transmission from host to host, amount of infective dose, and nature of the bacterial environment in the host's gut. WENYON also—a unicist who, however, separates *E. hartmanni*—alluded to the possibility of alteration of virulence in the course of a long succession of transmissions as an explanation of the different behaviour of *histolytica* and *dispar*. Brumpt, replying, affirmed his belief that things that seem identical may be different, and *vice versa*; and he stated that in his observation the characters and behaviour of *E. dispar* had remained unaltered through twelve successive transmissions and twenty subcultures.

A. A.

i. SMITH (Nannie M.) & BARRET (Harvey P.). **The Cultivation of a Parasitic Amoeba from the Cockroach.**—*Jl. Parasit.* 1928. June. Vol. 14. No. 4. pp. 272–273. With 5 figs. on 1 plate. [4 refs.] [Lab. of Dr. Harvey P. Barret, Charlotte, N.C.]

ii. TALIAFERRO (William H.). **A Note on the Amoeba of the Cockroach cultivated by Smith and Barret.**—*Ibid.* p. 274. [1 ref.] [Dept. of Hyg. & Bact., Univ., Chicago.]

i. Describes the successful cultivation—continued in a succession of transfers over a term of 24 months—of an amoeba from a cockroach, in a medium consisting simply of 1 part of inactivated human blood serum and 19 parts of a 0·5 per cent. solution of NaCl. The after end of the hindgut of the cockroach is dissected out and macerated in a few drops of the culture medium, and portions of the mixture are placed in the bottom

of tubes containing more culture medium. The tubes are placed in an icebox and generally produce amoebae in five days.

ii. The Entamoeba of the above study is determined to be *E. thomsoni* of Lucas (1927) of the *E. coli* alliance. A. A.

Castex (M. R.) & Greenway (D.). Ejemplares hematófagos de *Entameba coli*. [**Haematophagous** *E. coli*.]—*Arch. Argentinos enferm. Aparato Digest. y Nutric.* Buenos Aires. 1928. Vol. 3. No. 5. pp. 669–672. With 5 text figs.

The authors describe " haematophagous amoebae having the characters of the species *Entamoeba coli* " observed by them and illustrate their text with four figures of the amoeba, including an enlargement (1800 diam.) of one stained with iron-haematoxylin. A. A.

Greenway (Daniel). *Dientamoeba fragilis* en la Argentina. [*Dientamoeba fragilis* **in the Argentine.**]—*Arch. Argentinos enferm. Aparato Digest. y Nutric.* Buenos Aires. 1928. Vol. 3. No. 36. pp. 897–900. With 3 figs.

A description of this parasite is given together with a camera lucida drawing showing its structure. Infection in the Argentine is rare, the author having met with two cases only and he is unaware of any other recorded instances there. H. Harold Scott.

Lynch (Kenneth M.). **The Flagellated Protozoa of the Intestine. A Specific Analysis of the Conditions related to their Presence.**—*Amer. Jl. Trop. Med.* 1928. July. Vol. 8. No. 4. pp. 345–352. [9 refs.] [Med. College of the State of S. Carolina, Charleston, S. Carolina.]

The subjects of this study included people—residents of Northern Texas, mostly adult—complaining mainly of chronic disorder of the alimentary tract. They furnished no evidence that diarrhoea was related in any way to the presence of *Trichomonas hominis* or *Chilomastix mesnili* ; or that constipation was related to the presence of the Trichomonas though it was common in persons harbouring the Chilomastix. Among 240 patients infested with intestinal flagellates there was no case of arthritis deformans. Fifty-six per cent. of those harbouring Trichomonas were city people, while 80 per cent. of those with Chilomastix and 91 per cent. of those with Giardia were country people. Infestation with *Giardia intestinalis* was more frequent in early life, and with *Chilomastix mesnili* in later life ; but with *Trichomonas hominis* no particular age incidence was observed. Lowered gastric acidity seemed to be favourable for Chilomastix. A clinical diagnosis of chronic cholecystitis was recorded in about twice as many persons infested with Trichomonas and Chilomastix as in persons free from flagellates. A. A.

Schourenkowa (A. I.) & Lissovsky (L. L.). Contribution à la question de la culture des *Trichomonas*. [**The Cultivation of Trichomonas.**]—*Bull. Soc. Path. Exot.* 1928. Oct. 10. Vol. 21. No. 8. pp. 651–654. [1 ref.]

The authors find that the medium of Boeck and Drbohlav is not propitious for the cultivation of Trichomonas, probably, they think,

because the white of egg ingredient suffers such foetid corruption from the faeces added with the flagellates. This obstruction they moderate by adding animal charcoal to the solid substratum of the medium and by substituting simple saline solution for the Locke-albumin of the supernatant liquid. By these modifications they have kept cultures free from repulsive corruption for more than two months, and although in these old cultures no signs of survival of Trichomonas have been found, yet the flagellate makes its appearance in sub-cultures from them. The authors therefore think that they are on the brink of a discovery of some resistant static stage or gemmule of the flagellate.

A. A.

CLEVELAND (L. R.). *Tritrichomonas fecalis* **Nov. Sp. of Man; its Ability to grow and multiply indefinitely in Faeces diluted with Tap Water and in Frogs and Tadpoles.**—*Amer. Jl. Hyg.* 1928. Mar. Vol. 8. No. 2. pp. 232–255. With 3 plates. [6 refs.] [Med. School, Harvard Univ., Boston, Mass.]

——. **The Separation of a Tritricomonas of Man from Bacteria; its Failure to grow in Media Free of Living Bacteria; Measurement of its Growth and Division Rate in Pure Cultures of Various Bacteria.** —*Ibid.* pp. 256–278. With 1 fig. [18 refs.] [Med. School, Harvard Univ., Boston, Mass.]

A sample of human faeces which had been placed in tap water was found to contain amongst other protozoa a trichomonas which remained constantly present for 8 months. As the origin of the trichomonas was in doubt other samples of faeces were obtained from the same case and placed in tap water with the same result. On 5 occasions a sample of the faeces was divided into 2 parts one of which was heated. Both parts were then placed in sterilized tap water. On each occasion trichomonas appeared in the culture made from unheated faeces but not in the other. When trichomonas from a faecal culture was introduced into the negative heated faeces culture growth took place. Though direct examination of the faeces on no occasion revealed trichomonas it was evident that the organism was present in the faeces in some form. An oral trichomonas from the same case failed to develop in the faeces medium. The faecal organism will survive in a faeces culture for at least a year and will grow in practically any fluid which supports bacterial growth. Red blood corpuscles, yeasts, starch grains and even metallic particles are ingested if added to the media. When grown anaerobically in pure cultures of certain bacteria the trichomonas becomes nearly as numerous as red blood corpuscles in whole blood. Reproduction by binary fission as also by multiple fission takes place. Attempts were made to cultivate trichomonas from many animals in the same way but *Tritrichomonas augusta* of the frog alone grew. This species, is however, twice the size of the one of human origin, which is undoubtedly a distinct species for which the name *Tritrichomonas fecalis* is proposed. The human form will live and multiply over a wide range of temperature (–3° C to 37° C.) while *T. augusta* is killed in a few hours at 37° C.

By an elaborate process of washing with a serum saline medium and use of the centrifuge it was possible to obtain fluid which contained living trichomonas but no bacteria. Finally a culture of the organism was obtained in serum-saline medium in the presence of a pure culture

of a bacterium which appears to be nearly related to *Serratia rubefaciens* (Zimmermann). If such a culture is heated to 36°C the bacteria are killed but not the trichomonas, so that it was easy to inoculate the flagellates into pure cultures of other bacteria. By use of these pure strains it was demonstrated that the organism would not grow without bacteria, that it grew well with certain bacteria, poorly with others and not at all with some. An attempt to find a substitute for living bacteria in the shape of dead bacteria or other materials failed. It is clear that this easily cultured trichomonas affords an opportunity for study of many of the characteristics of the flagellates of this group.

C. M. Wenyon.

Cleveland (L. R.). **The Suitability of various Bacteria, Molds, Yeasts, and Spirochaetes as Food for the Flagellate *Tritrichomonas fecalis* of Man as brought out by the Measurement of its Fission Rate, Population Density, and Longevity in Pure Cultures of these Micro-organisms.**—*Amer. Jl. Hyg.* 1928. Nov. Vol. 8. No. 6. pp. 990–1013. [5 refs.] [Med. School, Harvard Univ., Boston, Mass.]

The author explains how he obtained pure cultures of his recently described *Tritrichomonas faecalis* and how he tried their appetite for 42 several kinds of microbes (bacteria, moulds, yeasts, and spirochaetes) offered as food. He finds that the said trichomonas is " somewhat of an obligate anaerobe " ; that although it undoubtedly came from man it " fails to grow with, that is, feed on, most of the common bacteria of the human intestine " ; and that it grows extremely well with *Aerobacter aerogenes*, but extremely poorly with certain other specified microbes ; and he infers from this last fact that its great abundance in certain individual hosts and its great paucity in others is thereby explained. The results of his feeding experiments are tabulated.

A. A.

Ratcliffe (Herbert L.). **The Numbers of Trichomonads in Rats on Diets of Different Protein Content in Relation to the pH and Bacteria in the Cecum.**—*Amer. Jl. Hyg.* 1928. Nov. Vol. 8. No. 6. pp. 910–934. With 1 text fig. [17 refs.] [School of Hyg. & Public Health, Johns Hopkins Univ., Baltimore, Md.]

Studying the effect of varying intestinal conditions upon the intestinal parasites Hegner found that rats kept on a diet poor in protein harboured large numbers of trichomonads which were rapidly decreased by a diet rich in protein. The author, experimenting with rats and *Trichomonas muris*, finds that the numbers of these flagellates vary inversely with the numbers of proteolytic anaerobes in the rat's intestine ; that the multiplication of these anaerobes there is furthered by a diet rich in protein ; and that of the proteins tested casein was more effective than beefsteak, and beef liver was of no account. He also finds that an intestinal flora predominantly aciduric (as on a carbohydrate diet) is not necessary for the development of heavy trichomonad infections ; and that the pH of the intestinal contents is affected by the nature of the food, although not apparently in such a way as to influence changes in the flora.

A. A.

Kessel (John F.). **Trichomoniasis in Kittens.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1928. June 30. Vol. 22. No. 1. pp. 61–80. With 14 figs on 4 plates. [17 refs.] [Peking Union Med. College, Peking, China.]

In the course of a study necessitating the use of a large number of kittens the author happened to meet with 9 that were naturally infected with a Trichomonas morphologically similar to *T. hominis* and not appreciably different from the cat-Trichomonas described and figured by Brumpt. Most of these kittens had enteritis and wasted and died, and after death the mucosa of their large intestine was found superficially inflamed and necrosed, infiltrated with the trichomonas, and in some cases superficially ulcerated. Cultures of Trichomonas from these kittens were transferred both *per os* and *per anum* to clean, healthy kittens, and in some cases their ingestion was followed by symptoms of enteritis and by similar pathological phenomena in the mucosa of the large intestine of the latter. Again trichomonads from cases of diarrhoea in man were transferred to clean kittens, with the result that the latter showed the same symptoms and lesions as the kittens found naturally infested with Trichomonas. Clean kittens were also experimentally infected with Trichomonas from monkey, white rat, and domestic pig.

From the facts thus established the author concludes that the trichomonads that have been found in cats by various observers may be infections derived naturally from other animals rather than a Trichomonas specific to the cat.

A. A.

Hogue (Mary Jane). **Trichomonas in Tissue Cultures.**—*Amer. Jl. Trop. Med.* 1928. July. Vol. 8. No. 4. pp. 325–337. With 24 figs. on 3 plates. [3 refs.] [School of Med., Univ. of Pennsylvania, Philadelphia.]

With a view to investigating their pathogenous possibilities the author introduced 5 species of Trichomonas and 1 of Pentatrichomonas into cultures of tissue (epithelium, fibroblasts, nerve-fibres) from the stomach and intestine of the embryo chick. Although the flagellates frequently came in intimate touch with the tissue-cells they were not observed to do the cells any mechanical injury.

A. A.

Ishida (I.). [**A Case of Trichomoniasis of an Infant.**]—*Oriental Jl. Dis. Infants.* 1928. Sept. Vol. 4. No. 2. [In Japanese. English summary pp. 5–6. With 5 figs.] [Pediat. Clinic, Imperial Univ., Kyoto.]

The infant suffered from vomiting and had slimy greenish evacuations in which Trichomonas and a spirochaete were found, and it was cured in 20 days by a daily enema of a 0·5 per cent. solution of quinine hydrochloride.

A. A.

Martens (A. H. A.) & Koers (Cornelie H.). Over Lamblia intestinalis. [*Lamblia intestinalis.*]—*Nederl. Tijdschr. v. Geneesk.* 1928. Aug. 4. 72nd Year. 2nd Half. No. 31. pp. 3781–3786. [2 refs.]

A woman, 25 years of age, suffered for a year from attacks of abdominal pain, followed by diarrhoea with slimy evacuations without blood. *Giardia*

intestinalis was found in the stools in great, but varying, numbers. In certain cases, like the one under consideration, some connexion between the symptoms and the presence of the parasites cannot be denied. Whether this connexion is primary or secondary is difficult to say; yet it appears probable that a pre-existing intestinal disturbance may constitute a favourable factor for the parasites' development.

In four instances the authors counted the number of parasites in the duodenal juice before and after the magnesium sulphate test of Meltzer-Lyon; in all instances the number of parasites was found considerably less after the test, *i.e.*, after the admixture of pure bile with the duodenal contents. This is against the gall bladder being the original site of the infection.

The attempts to treat the condition by means of calomel, santonin, salol, emetine injections yielded no results. Then arsenical preparations were administered and the duodenal juice tested before and after their administration for the presence of arsenic (quantitative estimation) and for the number of parasites. Arsenicals apparently have an antiparasitic effect, which is, however, only temporary (neo-salvarsan). The most practical way, therefore, appears to be administration of small doses over a long time. Stovarsol may be a suitable preparation for this purpose, but it also failed to produce a lasting success in the authors' case, though given during six months.

W. J. Bais.

Lwoff (Marguerite). Action favorisante du sang sur la culture du *Leptomonas ctenocephali* Fanth. (Flagellé trypanosomide). [**Favouring Action of Blood in the Culture of** *L. ctenocephali.*]—*C. R. Soc. Biol.* 1928. July 13. Vol. 99. No. 24. pp. 472–474. [6 refs.] [Pasteur Inst., Paris.]

Being dissatisfied with broth as an ingredient of varying composition for culture media the author has been cultivating *Leptomonas ctenocephali* in 2 per cent. solutions of various peptones in normal saline (or Locke solution without glucose, or Ringer's or Amar's solutions) with the addition, of course, of defibrinated (rabbit) blood. Peptones of fibrin, silk, casein, and defatted casein, Witte peptone, and solutions of albumose were not satisfactory; but extremely good cultures were invariably afforded with Chapoteaut peptone. These appeared 6 to 8 days after insemination, persisted in abundance for 45 to 60 days, and were easily subcultured. Attempts to cultivate in the peptone solution alone without blood were unsuccessful; but a first culture was successful with the addition of 1 part of blood per 10,000; from this a subculture was possible with 1 part of blood per 1,000; and from this again a poor culture was obtained with 1 part of blood per 500.

A. A.

Shortt (H. E.) & Swaminath (C. S.). **Preliminary Note on Three Species of** *Trypanosomidae.—Indian Jl. Med. Res.* 1928. July. Vol. 16. No. 1. pp. 241–244. With 1 plate. [5 refs.]

Typical aflagellate Leishmania elements were found in the peripheral blood of a gecko (*Hemidactylus* sp.). Cultures made from liver gave an abundant growth of typical Leptomonas forms. A brief description of the parasite is given and it was identified as *Leishmania hemidactyli* (Mackie, Gupta and Swaminath (1923).

The authors have also re-examined the Crithidia found in *Phlebotomus minutus* by Mackie, Gupta and Swaminath, and, as the result of experimental work, have shown that it is really a stage in the life-history of a trypanosome of the lizard. Whether this trypanosome is actually the *T. hemidactyli* of Mackie, Gupta and Swaminath is not quite certain, as the parasite found by the authors in their experimental gecko showed definite morphological differences from *T. hemidactyli*.

Two white mice and a guineapig were inoculated intraperitoneally with the gut contents of eight *Triatoma rubrofasciata* collected in Assam and containing *Crithidia conorhini* Donovan, 1909. Both mice showed trypanosome infection of the peripheral blood. The Triatoma in Assam is comparatively common in village houses, and the immature forms of all stages are most commonly met with in the nests and boxes of pigeons which many villagers keep. It is possible, therefore, the parasite may be that which has been reported from pigeons; but, on the other hand, the close resemblance of *T. vespertilionis* to *T. cruzi* suggests the possibility that a bat may be the vertebrate host. Further work on the three parasites is in progress.

W. Yorke.

Giordano (Mario). Sulla presenza di flagellati nel polmone umano. [**Flagellates in the Human Lung.**]—*Arch. Ital. Sci. Med. Colon.* 1928. June. Vol. 9. No. 6. pp. 346–354. With 2 text figs. & 31 coloured figs. on 1 plate. [Inst. of Colonial Path., Univ., Bologna.]

The patient, a man of 39, had fever and cough with sputa, nummular fetid and sometimes blood streaked. No tubercle bacilli, but abundant spirochaetes with fusiform bacilli and cystic forms, some phagocyted, which the author regards as cysts of *Chilomastix mesnili*. Sputum was injected under the skin of a rat which developed an abscess containing flagellates. He suggests the suitability of subcutaneous tissue of the rat for culture of this parasite.

H. Harold Scott.

Tsu (Tsien Yung). Ein Fall von *Prowazekia asiatica*. [**A Case of** *P. asiatica* **Infection.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1928. Sept. Vol. 32. No. 9. pp. 487–488. With 1 text fig.

The author describes and figures flagellates, determined as *Prowazekia asiatica*, in the stools of a case of chronic dysentery that had been unsuccessfully treated with emetine, but was now cured in a few days with " spirocide tablets " (stovarsol).

A. A.

Pawan (J. L.). *Phytomonas davidi* **in Euphorbia " Pilulifera," Trinidad.** —*Jl. Port-of-Spain Med. Soc.* 1927. pp. 159–165. With 3 coloured plates. [3 refs.]

Euphorbia pilulifera is a common annual in Trinidad, and the author has found both it and the salivary glands of the bug, *Orthoea servillei*, that feeds on its leaves and flowers, infected with *Phytomonas davidi*. Infected leaves are distinguished by their smaller size and reddish-brown discoloration.

A. A.

Corcuff (Charles). Recherches sur la spécificité parasitaire des coccidies. [**The Specificity of the Coccidia.**]—*Ann. Parasit. Humaine et Comparée.* 1928. Oct. 1. Vol. 6. No. 4. pp. 404–418. [25 refs.] [Parasit. Lab., Faculty of Med., Paris.]

Uhlhorn having recorded the successful experimental infection of chickens with the coccidium of the rabbit, the author here reports his inability to confirm that record. The author fed a series of carefully tended chickens, of ages ranging from one day to 32 days, with big doses of carefully collected and completely segmented oocysts of *Eimeria stiedai* obtained from rabbits' livers, but in no case did he observe any infection of the birds—or anything but a speedy elimination of the unchanged oocysts in the faeces. The paper is introduced with a historical resumé and concluded with a good bibliography.

A. A.

Carini (A.). Um caso de coccidiose intestinal humana por *Isospora belli*, observado em S. Paulo. [**A Case of Infection with** *Isospora belli*, **occurring in S. Paulo.**]—*Bol. Biol.* S. Paulo. 1928. Sept. 22. No. 13. pp. 79–80. [2 refs.]

The patient, a child of 4 years, still—after treatment for pyuria and worms—complained of abdominal pain, and passed irregular stools, loose and pasty at times and containing mucus, oocysts of *Isospora belli*, a few motile dysentery amoebae, occasional flagellates, and ova of Trichuris. Subsequently all except *Isospora belli* persisted; but some weeks later [treatment is not stated] the child became quite well. The development of the oocysts was watched under the microscope. To what extent the coccidia contributed to the condition could not, naturally, be determined. This is said to be the second case of human coccidiosis observed in Brazil, the first being recorded in 1925 by Pinto and Pacheco at the Oswaldo Cruz Institute.

H. Harold Scott.

Leger (Marcel). *Plasmodium* du *Cercopithecus callitrichus* de l'Afrique occidentale. [**Plasmodium of West African** *Cercopithecus callitrichus.*]—*Ann. Inst. Pasteur.* 1928. July. Vol. 42. No. 7. pp. 770–781. With 1 text fig. [18 refs.]

Plasmodium joyeuxi is described as a new species parasitic in the West African *Cercopithecus callitrichus*. The author has followed an infection for a term of eight months. Its appearance in the peripheral circulation is very irregular, no rhythm being evident. The schizonts have no definite cycle; one can only say that they appear less often and remain a shorter time visible than the gametocytes. The gametocytes, which are slightly larger than a red corpuscle, also are very irregular; they appear for varying terms at irregular intervals and disappear again for varying terms. The young trophozoites have not the signet-ring shape, their caryosome is more like a sausage occupying about two-thirds of the circumference of a ring; the older parasites are very actively amoebiform, sometimes having a reticulate (spider-web) appearance; schizogony has not been observed in the peripheral circulation. Parasitized red corpuscles are not enlarged, nor have Schuffner's granules or Maurer's spots been observed. The infected monkey has slight attacks of fever (oscillating about 39° C.) from time to time, but is not upset by them; these irregular attacks are abrupt in access, of brief duration, and of sudden ending.

A. A.

Cowdry (E. V.) & Cowell (W. P.) Etudes cytologiques sur le paludisme. Deuxième mémoire. Rapports quantitatifs entre les gametocytes femelles et les gametocytes mâles de *Plasmodium kochi*. [**Quantitative Relations between Female and Male Gametocytes of** *P. kochi*.]—*Arch. Inst. Pasteur de Tunis.* 1928. June. Vol. 17. No. 2. pp. 147–156. With 3 graphs in text. [14 refs.]

This is a statistical study of chronic infection of *Plasmodium kochi* of monkeys. The following phenomena are noted: (1) a rhythm of about 24 hours' duration in the number of gametocytes; (2) a more or less synchronous variation in the size of the gametocytes; (3) in measurements of 1,900 gametocytes an excess of about 0·043 μ in the female over the male cell; in a count of 9,500 gametocytes an excess in the proportion of 10 to 8 in the number of the females, and a curious oscillation in the proportion of the male and female gametocytes.

A. A.

Cowdry (E. V.) & Scott (G. H.). Etudes cytologiques sur le paludisme. III. Mitochondries, granules colorables au rouge neutre et appareil de Golgi. [**Cytological Studies on Malaria.**]—*Arch. Inst. Pasteur de Tunis.* 1928. Sept. Vol. 17. No. 3. pp. 233–252. With 25 coloured figs. on 1 plate. [27 refs.] [Pasteur Inst., Tunis & Rockefeller Inst. for Med. Research, New York.]

For these very technical cytological studies *Plasmodium praecox* of bird-malaria was used. They cannot be compressed or abstracted, but the following is their final conclusion: That supravital staining with neutral red, followed by treatment with osmic acid, shows that granules taking the stain are disposed in linear series which fuse to form coloured bands, and that under the influence of osmic acid these bands are blackened and eventually unite to form a typical Golgi apparatus. These observations are said to confirm strongly the theory of Parat that the Golgi apparatus might be formed by the confluence of droplets having an affinity for neutral red.

A. A.

Pritze (Felix). Beiträge zur Kenntnis des *Balantidium coli*. Das Balantidium des Schweines in seiner Beziehung zum menschlichen Balantidium und sein Verhalten unter natürlichen und künstlichen Bedingungen. Inaugural-Dissertation zur Erlangung der Doktorwürde, genehmigt von der Philosophischen Fakultät der Friedrich-Wilhelms-Universität zu Berlin. [**Balantidia of the Pig and of Man.**]—*Ztschr. f. Parasitenkunde.* 1928. Vol. 1. No. 3. pp. 345–415. With 47 text figs. [Numerous refs.]

Of the 70 pages of this inaugural dissertation on *Balantidium coli*, 26 are occupied by familiar details of form and structure, and 12 by a rather prolix account of the author's investigation of the conditions of its occurrence in the pig. The organism was found in 66 per cent. of 400 pigs examined—the active form occurring in 28·25 per cent., the best intestinal medium being softish faeces with much undigested vegetable matter, and a pH tenor of 6·4; it was not found in foetal pigs. The author's numerous observations confirm the opinion that

infestation is effected per os, by cysts, though he does not dispute the possibility of the anal route by the active (" vegetative ") form. A great variety of artificial breeding media were tried, and in amnion fluid at room temperature the organism lived 474 hours. There is a copious bibliography with a conspicuous absence of any British name.

A. A.

Michailowa (M. A.) & Oudintzew (G. N.). Contribution à l'étude de la balantidiose. [**Note on Balantidiasis.**]—*Russian Jl. Trop. Med.* 1928. Vol. 6. No. 3. French summary pp. 207–208. [In Russian pp. 178–184. With 8 text figs. 40 refs.]

In reporting a case of balantidiasis the authors review the history of this infestation in Siberia, where 16 cases have been recorded. They studied under the microscope the effect upon the ciliates (in vitro) of solutions of emetine in water and in blood, besides observing their behaviour in blood and in physiological saline ; the ciliates died quickest in pure (? watery) solution of emetine. It is noted that an English preparation of emetine nearly 14 years old had almost no effect.

A. A.

Franchini (Giuseppe). Balantidiosi nell' uomo. [**A Case of Human Balantidial Infection.**]—*Arch. Ital. Sci. Med. Colon.* 1928. Aug. Vol. 9. No. 8. pp. 453–457. With 1 text fig. [Inst. of Trop. Path., Univ., Bologna.]

A child of 4 years, with abdominal pain and loose motions containing blood and mucus ; *Balantidium coli* was present in considerable numbers. Sigmoidoscopy revealed reddening and slight ulceration. Cure was rapid on stovarsol, 10 cgm. daily by mouth, and enemata of ipecacuanha, 1 per cent.

H. Harold Scott.

Sainte-Marie (P. E. Flye). Organisme voisin de la *Sergentella hominis* trouvé dans des urines sanglantes. [**Organism near *Sergentella hominis* found in Bloody Urine.**]—*Bull. Soc. Path. Exot.* 1928. July 11. Vol. 21. No. 7. pp. 515–517. With 2 text figs. [Cocard Hosp., Fez, Morocco.]

The organism here described and figured was found, in some abundance, in the urine of a Mahomedan about 40 years old who for two months on the present occasion (and for about 8 days some 2 or 3 years ago) had been the subject of a painless haematuria having no obvious ill effects, although tenderness in the loins could be elicited, more particularly on the left side. It is a vermiform body 35 μ–85 μ long and 1 μ–1·6 μ broad. By Giemsa staining it shows a rosy cytoplasm, a coarse, usually subcentral, bluish lump (? nucleus), and a little clump of bright red granules in the distal and more attenuated third of the body ; rarely two nuclei (?) are visible, situated either in the anterior or the middle third of the body. E. Sergent places the organism near *Sergentella hominis*.

A. A.

Raffaele (Giulio). Su di un microrganismo di dubbia natura rinvenuto in un preparato di sangue umano. [**On an Organism of Doubtful Nature, found in a Human Blood Film.**]—*Riv. di Malariologia.* 1928. May–June. Vol. 7. No. 3. pp. 267–270. With 1 coloured plate. [English summary pp. 405–406.] [Experim. Station, Anti Malaria Campaign, Rome.]

The author describes and figures a "parasite," numbers of which were found, in one preparation only, in the blood of a four-months' child; it is elliptical [elongate-elliptical with one end attenuated and pointed] and has a lump of chromatin either eccentric or near the middle.

A. A.

Stiles (C. W.) & Hassall (Albert). **Key-Catalogue of Insects of Importance in Public Health.**—*Treasury Dept. U.S. Public Health Service. Hyg. Lab. Bull.* No. 150. 1928. Mar. pp. 291–408.

This valuable pamphlet of 118 pages "represents Part 4 of Stiles and Hassall's Host Catalogue, Index Catalogue of Medical and Veterinary Zoology." It is not a descriptive catalogue but is a reference index to the names, zoological status, and particularly-recorded activities of the species of insects that are known (or believed) to influence in any way—be it even through the imagination—the public health. Those who are not accustomed to works of this kind will find instructions for using the catalogue in the "Key Catalogue of the Protozoa reported for man," which is Bulletin No. 148 of the same series.

Insects of importance to the public health service are here alphabetically arranged under 17 general headings, according to the obvious nature or venue of their importance, as biters, cadaver-haunters, controlling-agents against other pests, of dermatological consequence, edible matter (chiefly by uncivilized tribes), excreta-haunters, food-dwellers, of jurisprudential import, of laic lore and superstition, parasites and pseudoparasites, pests in habitations and shops of divers kinds, pinchers, of poisonous interest, polluters, stingers, of therapeutic significance, and vectors (carriers, intermediary hosts). That there appears to be a considerable disregard of logic in this classification is an undoubted merit in a work of this sort.

Within each of these 17 general headings the insect agents are arranged according to the particular method or sphere of their activity, and therewithal and thereunder in their natural orders.

A. A.

Carter (H. F.). **Report of the Medical Entomologist for the Year 1927.**—*Ceylon Administration Rep. Director of Med. & San. Services* 1927. Appendix pp. C 62–C 70.

This report contains full details of very careful local surveys of the anopheline fauna in Ceylon. An investigation was made during the north-east monsoon of the natural infectivity of the anophelines of villages and estates in the malarious low-lying and coast tracts lying about twenty miles north of Colombo. Here the species found in huts, cooly-lines and cattle sheds were *A. culicifacies* (much predominant), *A. listoni*, *A. subpictus*, *A. barbirostris*, *A. hyrcanus*, *A. fuliginosus*, *A. jamesi*, *A. tesselatus*, *A. maculatus* and *A. karwari*—the last seven species sparely. Of 1,440 specimens collected for dissection, *A. culicifacies* constituting 80 per cent. of them, this species was the only one found

naturally infected—the stomach in 16 and the salivary glands in 17 individuals. The breeding-places of these species were determined in pools, swamps, streams, puddles, earth-drains, coconut-trenches, borrowpits, and wells of various kinds. A malaria survey was carried out at the sanatorium and military training camp of Diyatalawa, 4,200 ft. Examination of hospital records and of children showed little evidence of malaria. The species of Anopheles here found were, in 9,256 larvae examined, *A. maculatus*, 56·6 per cent.; *A. jamesi*, 30·2; *A. hyrcanus*, 8·3; *A. listoni*, 3·8; and collectively 1·1 per cent. of *barbirostris, vagus, tessellatus, aitkeni, culicifacies, fuliginosus*, and *gigas*. The first four species of this list were found from time to time in the houses and huts of the camp.

A. A.

Buddle (R.). **Entomological Notes on the Canton Delta.**—*Jl. Roy. Nav. Med. Serv.* 1928. July. Vol. 14. No. 3. pp. 190–200.

An interesting paper by an observant author. In the Delta the house-haunting *Culex fatigans* and *Stegomyia scutellaris* (*Aedes albopictus*) are the commonest of all the local species. *S. fasciata* (*Ae. aegypti*) was not found. The author notes a concurrence of dengue fever and *Ae. albopictus* in an island within the British concession in one particular year when the great majority of mosquitoes caught and bred there were of this species. The local Anopheles are *A. sinensis, A. barbirostris, A. maculatus, A. rossi, A. kochi*, and *A. maculipalpis*. In the low lands of the delta 98 per cent. of the anophelines are *A. sinensis*, the greatest numbers occurring in the winter. Locally all these species are said to prefer clean clear water, and in summer when the Chinamen stir up the mud in the ricefields larvae of *A. sinensis* are seldom seen there. The author mentions a (well known) army of enemies of mosquito larvae; the most active observed by him were the " water-boatmen " bugs and an Anabas fish. He has not observed Phlebotomus in the delta, but reports Simulium to be common. Among Arthropods of medical interest he mentions a Solpugid and the popular delusion that it has a vesicant secretion. He attributes the mysterious eruption not to the Solpugid but to a small Staphylinid beetle of local occurrence.

A. A.

Wollman (E.), Anderson (Ch.) & Colas-Belcour (J.). Recherches sur la conservation des virus *hémophiles* chez les insectes. [**The Preservation of Haemophilic Viruses in Insects.**]—*Arch. Inst. Pasteur de Tunis*. 1928. Sept. Vol. 17. No. 3. pp. 229–232. [4 refs.]

In his earlier experience (this *Bulletin*, Vol. 25, p. 825) with houseflies reared by his aseptic method (*o.c.*, Vol. 18, p. 200, and Vol. 19, p. 117) the senior author was struck by the rapidity with which such flies cleansed themselves from infection with *Trypanosoma inopinatum* and the bacilli of Weeks and of Morax-Axenfeld. These being organisms that must be cultivated in a medium containing blood or serum, the author speculates on the possibility of the want of the blood ingredient being the explanation of the phenomenon observed in houseflies. In

his present experiments, comparing the relative infectivity of blood-sucking flies (Stomoxys) with insects that do not feed on blood (Musca, Lucilia, and cockroaches), and using *Spironema recurrentis* as the infective organism, he finds that whereas the Stomoxys after feeding on an infected rat remains infective for 48 hours, in the other insects fed on cultures the spirochaetes disappear quickly.

In other experiments an aseptically reared housefly fed on rich cultures of *Leishmania tropica* did not infect NNN medium to which it was transferred, mashed, 4½ hours afterwards.

A. A.

Weidling (Kurt). Die Beeinflussung von Eiröhrenzahl und -grösse einiger Dipteren durch Hunger im Larvalstadium mit einigen Beobachtungen ueber die Chaetotaxis der Hungertiere und ueber den Einfluss verschiedener physikalischer und chemischer Einwirkungen auf den Entwicklungsgang dieser Tiere (*Calliphora erythrocephala*, *Stegomyia fasciata* und *Anopheles maculipennis*). [**Influence of Starvation on the Number and Size of Ovarian Tubules in the Larval Stage of Diptera.**]—*Ztschr. f. angewandte Entom.* 1928. July. Vol. 14. No. 1. pp. 69–85. With 5 text figs. [18 refs.] [Inst. for Ship & Trop. Diseases, Hamburg.]

The author, whose observations are not entirely new, [since he seems to be not aware of G. Cousin's important work (see this *Bulletin*, Vol. 23, p. 871, and Vol. 24, p. 432) on the effects of malnutrition upon the development of *Calliphora erythrocephala*] has studied the results of starvation in that species as well as in *Anopheles maculipennis* and *Stegomyia fasciata*. He notices that hunger prolongs the period of larval development, and that adults from starved larvae are dwarfed, and he observes, further, that the dwarfed females have fewer ovarian tubules and produce fewer eggs, and furthermore, that the larvae issuing from such eggs do not develop, even if they be well fed, into quite normal adults. This last observation was not demonstrated in the case of *Anopheles maculipennis*, but assuming it to apply to that species, the author thinks that it supports the opinion that the large and small forms of that species found in different places in Holland are distinct races. The author also has observed that the number of bristles is diminished in the dwarfed adults produced by starved larvae—a matter for consideration by taxonomists. He confirms the observations that strong light hinders the larval development of Calliphora, and that a large excess of males issues from a brood of hunger-stricken larvae. He observed that thymus and thyroid extract seemed to have no hormone effect upon the growth of his flies.

A. A.

Herms (W. B.). **The Effect of Different Quantities of Food during the Larval Period on the Sex Ratio and Size of** *Lucilia sericata* **Meigen and** *Theobaldia incidens* **(Thom.).**—*Jl. Econom. Entom.* 1928. Oct. Vol. 21. No. 5. pp. 720–729. [4 refs.]

Lots of blow-flies (*Lucilia sericata*) resulting from maggots allowed to feed (on beef-lung) to the full natural term showed a sex-ratio of

from 2·8–3·1 males to 6·9–7·2 females, while other lots resulting from maggots allowed to feed for only 30–36 hours showed a ratio of 6·2–6·5 males to 3·5–3·8 females. On the other hand, with lots of mosquitoes (*Theobaldia incidens*) from larvae well-fed (on yeast, in distilled water) the ratio was 5·5 males to 4·5 females, while with other lots from larvae stinted of the same diet the ratio was 3·3 males to 6·7 females. Other details of length of wing are given.

A. A.

Cooley (R. A.). **Montana's Laboratory for the Study of Insect-Borne Diseases.**—*Amer. Jl. Public Health.* 1928. Aug. Vol. 18. No. 8. pp. 993–996.

"Probably there does not exist another research laboratory like the one of the Montana State Board of Entomology now nearing completion at Hamilton." Its aims are to study the insect-borne diseases of men and animals for the purpose of their eradication and prevention. The immediate problems are the ticks locally responsible for the spread of Rocky Mountain spotted fever, tularaemia, and tick-paralysis.

A. A.

Bertwistle (A. P.). **Antistreptococcal Serum for Insect Bites.** [Memoranda.]—*Brit. Med. Jl.* 1928. Aug. 25. p. 342.

Abstract of two cases of swift lymphangitis following fly-bite, arrested and extinguished by injection of polyvalent antistreptococcal serum. It seems from the author's inquiries that Stomoxys is responsible for most of the fly-bites that have fatal results in this country.

A. A.

Franchini (Giuseppe). III nota di entomologia sulle colonie italiane. [**Third Note on the Entomology of the Italian Colonies.**]—*Arch. Ital. Sci. Med. Colon.* 1927. July. Vol. 8. No. 7. pp. 363–366. [5 refs.] [Inst. of Trop. Path., Univ., Bologna.]

The species here said to be new to the record are *Anopheles superpictus* in Cirenaica; *A. mauritianus* and *algeriensis* in Tripolitania; and *Ornithodorus lahorensis*, by no means uncommon, in the oasis of Gadàmes.

H. Harold Scott.

Franchini (G.). Nuove osservazioni di entomologia nelle colonie italiane. [**Fresh Entomological Observations in Italian Colonies.**]—*Arch. Ital. Sci. Med. Colon.* 1928. Oct. Vol. 9. No. 10. pp. 579–580. [Inst. of Colonial Path., Univ., Bologna.]

Professor Franchini continues his brief preliminary notes on the entomology of Tripolitania and Erithraea, here noticing the Ixodidae and Diptera Pupipara.

H. Harold Scott.

Iyengar (M. O. T.) **Mosquitoes in Relation to Disease. Instructions for Field Officers.**—16 pp. With 9 figs. Govt. of Bengal. Public Health Dept. 1928. Calcutta: Bengal Govt. Press.

This little pamphlet is intended for sanitary officers in the field. It tells how Culex, Stegomyia, and Anopheles are differentiated, and

sketches their relations to certain diseases ; it describes the life-history of a mosquito very briefly, and the procedure for collection of larvae and adults ; it deals discursively but practically with methods of destroying larvae and adults, and it ends with a key for identifying species of Anopheles found in Bengal. The figures that illustrate the text are crude, and those purporting to illustrate the equipment required for collecting and breeding mosquitoes may be fairly called grotesque.

A. A.

Fermi (Claudio). L'ombreggiamento come radicale ed economico mezzo di disanofelizzazione e di lotta contro la malaria. [**Shade as an Economic Anti-Mosquito Measure.**]—*Malariologia.* 1928. July 15. pp. 19–25. [1 ref.] [Hyg. Inst., Univ., Sassari.]

The author observing in Sardinia the absence of *Anopheles maculipennis* larvae from pools lying in permanent shade yet inhabited by Culex larvae, recommends the sterilizing of potential Anopheles breeding-places by artificial shade. He gives a list of 28 evergreens and 14 deciduous trees and shrubs that are suitable, and describes the mode and the cost of planting such shade.

A. A.

Senior-White (Ronald). **Physical Factors in Mosquito Ecology. Part II.**—*Indian Jl. Med. Res.* 1928. July. Vol. 16. No. 1. pp. 11–30. With 2 text figs. & 5 figs on 2 plates. [20 refs.]

The interesting and well-digested investigations here recorded were made at Delhi, and comprehended tanks, irrigated land, river floods, rain pools, and borrow-pits. The author thinks that the detailed study of the composition of the plancton is useless unless it all be distinctly specific. As a warning he comments on the " absurd results the Winkler process [for determination of dissolved oxygen] is liable to lead one in the presence of much nitrite." He is justified of some commonsense criticism of certain observers who have ventured to conclude that high temperature is the great destroyer of mosquito larvae in Nature. His present observations do not support his former conclusion that individual species live within definite ranges of H ion concentration. In the matter of conductivity he concludes that preference is a purely local phenomenon. The study of carbonates and albuminoid ammonia he has also found quite useless. He has found consolation, however, in a resuscitated paper where Waddell (1903) showed that one part of strong liquor ammoniae in 4,000 is absolutely fatal to full-grown mosquito larvae and computed that a dilution of 1 in 30,000 should be inhibitive to new-hatched larvae. This has encouraged the author to pay further attention to the influence of saline ammonia which in his previous surveys he had observed to be inhibitory to natural water breeders, particularly anophelines, in amounts of less than 1 part per million. His present studies have confirmed that observation for anophelines except *A. rossi*, in so much as to requite him for all the disappointments of his studies. The paper should be read for its instructive methods and details.

A. A.

SENIOR-WHITE (Ronald). **On the Relationship existing between Carbonates and pH and Conductivity in Natural Waters.**—*Indian Jl. Med. Res.* 1928. Apr. Vol. 15. No. 4. pp. 989–996. With 2 text figs. [9 refs.] [Central Malaria Bureau, Kasauli, India.]

In the course of a series of routine analyses of waters, in connexion with the study of mosquito breeding-places, the author has observed the existence of very close relations between " (i) the pH value and the percentage of the total carbonates present in what BIRGE and JUDAY call ' free ' and ' half-bound ' forms, *i.e.*, as CO_2 gas and as bicarbonate (which together may be summed up as ' movable ' carbonate), in contradistinction to the ' fixed ' carbonate ; and (ii) the total carbonate in all states, including dissolved free CO_2, and the conductivity of the water as measured by a Kohlrausch bridge and cell." The evidence is tabulated and discussed.

A. A.

BLOW (T. B.). **Observations on the Alleged Larvicidal Properties of Charophyta.**—*Proc. Linnean Soc. of London.* 1926–27. Session 139. pp. 46–47.

In the course of his two-months' exploration of Madagascar, for the purpose of investigating the Characeae of the island, the author certainly noticed pieces of water in which Charophytes were growing freely and mosquito larvae were not to be found, and other pieces of water in which mosquito larvae were plentiful and Charophytes could not be found ; but in the course of exact experiments in England, extending over nearly a year, he has come to the conclusion that the contrasted phenomena are not due to any antagonism between Charophytes and mosquito larvae. In the said experiments he has cultivated some of his Charophytes, namely *Chara desmacantha*, *C. macropogon*, *C. delicatula*, *C. contraria*, *Laprothamnium papulosum*, and *Nitella opaca*, and he finds that larvae of *Culex pipiens*, *Theobaldia annulata*, and *Anopheles maculipennis* in their company " enjoyed a vigorous life, and a very large percentage attained to the winged insect." Extract of *Chara zeylanica* (also brought from Madagascar) was used with the same result.

A. A.

PRUTHI (Hem Singh). **Some Insect and Other Enemies of Mosquito Larvae.**—*Indian Jl. Med. Res.* 1928. July. Vol. 16. No. 1. pp. 153–157. [2 refs.]

In these experiments the natural enemy in each case was set among mosquito larvae in a pound jar of pondwater with a small quantity of waterweed. In these artificial circumstances favourable to the enemy the author observed, as enemies, besides numerous well-known forms, freshwater shrimps and crabs and the tadpoles of a common frog. He was also impressed by the fact that there was great mortality among larvae set in a jar of pondwater fouled by the excreta of an apple-snail. Similar mortality occurred with mollusks of other species, with the single exception of an *Indoplanorbis exustus*.

A. A.

Barbieri (Antonio). Sensibilizadores fluorescentes como larvicidas. Acción fotodinámica de la luz. [**Larvicide Power of Fluorescent Sensitizing Substances. Photodynamic Power of Light.**]—*Riv. di Malariologia.* 1928. July–Aug. Vol. 7. No. 4. pp. 456–463. With 1 text fig. [English summary p. 626.] Also in *Medicina Países Cálides.* Madrid. 1928. Nov. Vol. 1. No. 6. pp. 523–530. With 1 text fig.

The author states that certain fluorigenous substances of the order of phthaleins, which absorb actinic rays, possess a strong larvicidal power even in extremely weak solutions. The most potent of the many studied by them is Bengal Rose, which is active even in a solution of 1 in 1,500,000, even in diffused sunlight. For practical purposes the authors suggest a solution of 1 in 500,000; the larvicidal action is observed in 24 hours.

A. A.

Hecht (Otto). Ueber die Sprosspilze der Ösophagusausstülpungen und über die Giftwirkung der Speicheldrüsen von Stechmücken. [**On the Blastomycetes of the Oesophageal Diverticula and on the Virulence of the Salivary Glands of Mosquitoes.**]—*Arch. f. Schiffs-u. Trop.-Hyg.* 1928. Nov. Vol. 32. No. 11. pp. 561–575. With 7 text figs. [37 refs.] [Inst. for Ship & Trop. Diseases, Hamburg.]

A general review of a subject that is still rather vague, and for an accurate understanding of which, as the author says, comparative observations of the natural effects of the bite of different species of flies on different men are much to be desired. The author in culture preparations from at least 70 insects found yeasts in only three instances, and he therefore concludes that these organisms find their way into the oesophageal diverticula from imbibed food and are not present as regular symbiotes.

A. A.

Pawlowsky (E. N.) & Stein (A. K.) with Perfiljew (P. P.). Experimentelle Untersuchungen ueber die Wirkung der wirksamen Bestandteile der Mücke *Culex pipiens* auf die Menschenhaut. [**Effect of Active Constituents of *C. pipiens* on Human Skin.**]—*Ztschr. f. Parasitenkunde.* Berlin. 1928. Oct. 27. Vol. 1. No. 3. pp. 484–488. [Zool. Inst., Milit. Med. Acad. & Skin Clinic, State Inst. for Med. Science, Leningrad.]

The reaction upon the human skin of subcutaneous injections of saline emulsions of certain tissues of *Culex pipiens*—namely of salivary glands, of oesophageal diverticula, and of crop (Magen) are compared in tabulated detail. The authors are convinced that the salivary secretion causes urticaria—quite apart from any question of contamination by micro-organisms.

A. A.

Langeron (Maurice). Les larves anormales de moustiques, ou larves à collier et à cerceaux. [**Abnormal Mosquito Larvae.**]—*Ann. Parasit. Humaine et Comparée.* 1928. July 1. Vol. 6. No. 3. pp. 273–283. With 16 text figs. [2 refs.] [Parasit. Lab., Faculty of Med., Paris.]

The author remarks the occasional appearance in Culicid larvae of duplications of divers adjuncts of the cuticle, *e.g.*, hairs that may remain

appressed to the cuticle in hoops or circlets; or, in Anopheles larvae, a collar-like overgrowth of the after part of the head accompanied by duplication of some of the abdominal palmate scales. They may, perhaps, be explained as precocious developments anticipatory of a normal moult.

A. A.

Borel (E.). Les moustiques de la Cochinchine et du Sud-Annam. [**The Mosquitoes of Cochin-China and S. Annam.**]—*Arch. Insts. Pasteur d'Indochine.* 1926. Apr.–Oct. No. 3 & 4 and 1928. Apr. No. 7. pp. 75–121; 75–106. With 27 plates. [Numerous refs.]

This is a monograph of the mosquitoes of Cochinchina and South Annam with the usual synoptic tables of subfamilies and genera and species and individual specific descriptions of male, female, and larva. The author follows Neveu Lemaire's treatment in five subfamilies—Anophelinae, Culicinae, Megarhininae, Uranotaeniinae, and Sabethinae. The two present instalments contain but do not complete the account of the Culicinae.

A. A.

Shannon (R. C.) & del Ponte (E.). Los culicidos en la Argentina. [**Argentina Culicidae.**]—*Rev. Inst. Bacteriológ.* Buenos Aires. 1927. Nov. Vol. 5. No. 1. pp. 29–140. With 23 text figs. [134 refs.]

A descriptive catalogue of the Argentine Culicidae, with keys and a bibliography.

H. Harold Scott.

Franchini (G.). Su di alcune specie di zanzare non ancora descritte nelle nostre colonie. [**Species of Mosquitoes not previously found in Italian Colonies.**]—*Arch. Ital. Sci. Med. Colon.* 1928. Aug. Vol. 9. No. 8. pp. 458–459. [Inst. of Colonial Path., Univ., Bologna.]

In the oasis of Tauorga (Tripolitania) *A. mauritianus*, which at certain times of the year is the only anopheles found, is undoubtedly the vector of malaria. *Aedës mariae, detritus, caspius* and *argenteus* are also present. In Erithraea, *A. mauritianus* and *Ae. argenteus*, and, in Somalia, *Ae. albicosta* were prevalent.

H. Harold Scott.

Symes (C. B.). **Notes on Anophelines and Malaria in Kenya.**—*Kenya & East African Med. Jl.* 1928. Aug. Vol. 5. No. 5. pp. 138–183.

An interesting record of 12 months' work, from March, 1926, to April, 1927. The chosen breeding-waters of 11 local species of Anopheles are described in individual detail, and among statements of general interest it may be noted that larvae were never found in water that deposits ferric hydroxide. In all places *Anopheles gambiae* (=*costalis*) is the prevalent species; in Nairobi it is by far the commonest "domestic" species all the year round and there it finds breeding-grounds to its heart's content, not only in irrigation channels of market gardens, but (during the rainy season) in the places provided

by unwitting man. It appears to be the chief malaria-carrier. Other "domestic" species in Nairobi and elsewhere are *A. christyi*, *A. cinereus*, and *A. funestus*, but none of them in anything approaching the numbers reached by *A. gambiae*. In Nairobi *A. christyi* was found in noticeable numbers only between August and January, and *A. cinereus* only between September and January, while *A. funestus* was only seen in houses between April and September and then only in numbers hardly worth notice. In some of the districts, however, the last-named species—a notorious malaria-carrier—is abundant at times. In the control of mosquitoes in Kenya reliance is placed on oiling, filling, and drainage—and also (in smaller settlements) in taking warning from Nairobi, where in the past so much was done, unwittingly, to perpetuate the breeding of mosquitoes.

A. A.

Schwetz (J.). Quelques considérations sur l'aspect entomologique de la lutte antimalarienne au Congo belge. [**Notes on the Entomological Aspect of Antimalarial Measures in Belgian Congo.**]—*Ann. Soc. Belge de Méd. Trop.* 1928. June. Vol. 8. No. 1. pp. 27–39. [4 refs.]

The author gives a list of 17 species and 3 varieties of Anopheles native to the Belgian Congo. The three commonest are *A. gambiae* (=*A. costalis*), *A. funestus*, and *A. marshalli* var. *moucheti*, the two first being almost ubiquitous and the third abundant in many places. The breeding-grounds of *A. costalis* (the familiar name, which the author prefers) are very varied and sometimes difficult to find, those of *A. funestus* are hard to trace even in places where the adults at certain seasons are found abundantly in houses, and those of *A. marshalli* var. *moucheti* are not yet discovered and may be of a particular kind. The author therefore concludes that there can be no uniform and stereotyped method of defence against Anopheles, but that the bionomy of each several species must be carefully studied as a necessary preliminary.

A. A.

Anazawa (K.). [**Studies regarding the Distribution and the Habits of Anophelines in Formosa.**]—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1928. May. No. 278. [In Japanese. English summary pp. 37–40.] [Govt. Research Inst. & Soc. of Investigation into Epidemic Diseases, Formosa.]

Ten species of Anopheles are known in Formosa, namely *A. sinensis*, *minimus*, *maculatus*, *tessellatus*, *fuliginosus*, *splendidus*, *hatorii* [*ludlowi*], *pleccau* [*lindesaii*], candidiensis [*A conitus*], and a species with unspotted wings. All ten species are to be found in the "secondary mountain ranges" (300 to 1,500 metres elevation), but at the greatest elevations (up to about 3,000 metres) only *A. maculatus* and *pleccau* may remain. On the foothills (below 300 metres) *A. minimus*, *sinensis*, and *tessellatus* are the species usually seen; on the plains these three and *A. hatorii*; on great plains of the sea-coast *A. sinensis* may be the only species. The house-haunting species are *A. sinensis* and *minimus*.

A. A.

Puri (I. M.). **The Relationship of Certain Morphological Characters of Anopheline Larvae to the Classification of Indian Anopheline Mosquitoes.**—*Indian Jl. Med. Res.* 1928. Oct. Vol. 16. No. 2. pp. 519–528. With 9 figs. on 2 plates. [7 refs.] [Central Research Inst., Kasauli, India.]

From a close study of full-grown larvae of the Indian anophelines the author finds that they fall into well-defined groups characterized mainly by certain features of the inner anterior clypeal hairs and of the anterior pair of thoracic pleural hairs, and that the grouping has a general correspondence with the classification of the adults based by Christophers on the male genitalia and to a less extent with that based by Barraud and Covell on the bucco-pharyngeal armature.

A. A.

Iyengar (M. O. T.). **Structure and Function of the Contractile Thoracic Appendages of the Anopheles Larvae.**—*Indian Jl. Med. Res.* 1928. Oct. Vol. 16. No. 2. pp. 281–296. With 30 figs. on 4 plates & 4 text figs. [3 refs.]

An interesting and well-completed entomological study.

The paired structures described by the author, originally in 1921, and now again and in great detail, as contractile thoracic "appendages," are situated, one on each shoulder of the Anopheles larva, just above the bases of the anterior pair of thoracic hairs. The author shows that they have nothing to do with the developing breathing-trumpets of the pupa. But from their constant presence in all the Anopheles species (29) that he has examined, and from their well-developed contractility, he thinks that they serve—and even better than the palmate scales of the abdomen—to moor the larva to the surface of the water, and also to hold it there firmly against both the twist of the head and the propulsion of the mouth-brushes in feeding.

A. A.

Achundow (Ismail). Die Modifikation der Anophelen unter den äusseren Bedingungen und kritische Betrachtungen der Rassenfrage. [**Modification of Anopheles by the Environment; and Critical Observations on the Race Question.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1928. Nov. Vol. 32. No. 11. pp. 547–561. With 8 text figs. & 13 coloured figs. on 1 plate. [17 refs.] [Inst. for Ship & Trop. Diseases, Hamburg.]

Rearing larvae of mosquitoes in glass vessels of different colours the author found that, with the perverse exception of *Stegomyia fasciata*, the colour and size of the larvae and pupae, and the size of the resulting adult, were influenced by the colour of the vessel; in the case of the two species of Anopheles observed (*A. maculipennis* and *bifurcatus*) the colour of the resulting adult also might be so influenced. The larvae and pupae reared in dark vessels were dark and were larger, and those reared in white and grey and green vessels were yellowish or whitish and were smaller; and the hinder abdominal segments of the two species of Anopheles were lighter in the adults proceeding

from larvae reared in white vessels than from larvae from dark-coloured vessels. The dark colouring generally was due to pigment in the skin as well as in the fat-body. The author points out that the differences observed have no bearing upon the origin of " races."

A. A.

Walch (E. W.) & Sardjito (M.). **Identification of the Bloodmeal of Netherlands Indian Anopheles by Means of the Precipitin-Test (First Report).**—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië.* 1928. Vol. 17. Pt. 2. pp. 234–250. [13 refs.]

—— & ——. Onderzoek naar den aard van het bloedmaal van Nederlandsch-Indische Anophelinen met behulp van de praecipitinen-reactie (Eerste mededeeling).—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1928. Vol. 68. No. 2. pp. 247–266. [13 refs.] English summary pp. 266–268. [Med. Lab., Weltevreden.]

The authors (who remind us that the precipitin test for the identification of the stomach-contents of mosquitoes was first employed by Weidanz in 1908) prepared their precipitin sera by Teukasaki's method, in which the precipitate obtained in serum by alcohol is used as antigen. The material tested consisted either of the mosquitoes themselves or (much better) of the ingested blood preserved on filter-paper ; such material gave well defined reactions, even up to 10 months afterwards. Many specimens did not contain enough blood to respond. It was not possible to distinguish certainly between blood of sheep, goat, buffalo, and cow. The following is the result of tests of Anopheles *captured in houses* in Java : Of 13 *A. ludlowii* 6 contained human blood (of 26 captured in a buffalo-shed hard-by, 3 contained human blood). Of 26 *A. rossii* only 1 had human blood. Of a few specimens of *A. vagus* and *A. tessellatus* all contained buffalo blood. Of 12 specimens of *A. sinensis* the blood was human in 10, buffalo in 1, and chicken in 1. Of 4 *A. barbirostris* all contained buffalo blood. Of 27 *A. aconitus* 2 contained human blood and 25 buffalo blood. (Specimens of *A. umbrosus*, *A. punctulatus*, and *A. bancrofti* from other islands —but no circumstances of capture stated—all contained human blood).

A. A.

Beklemischev (W.) & Mitrophanova (J.). Sur l'écologie larvaire de l' " Anopheles maculipennis " Mg. (Quelques prémisses expérimentales). [**On the Larval Ecology of** *Anopheles maculipennis* **Mg.**]—*Riv. di Malariologia.* 1928. July–Aug. Vol. 7. No. 4. pp. 464–483. [11 refs.] [Bact. Inst., Perm, U.R.S.S.] [English summary p. 626.]

The provisional conclusion of these interesting studies of *Anopheles maculipennis* in Nature is that the felicity of its larval stages is conditioned not only by the quantity and quality of the pabulum (plancton) but also by the oxygen tension, the reaction, and the specific properties of the watery medium ; but that adversity in any or all of these four factors is not absolutely and vehemently catastrophic. Larvae may survive and eclosion follow in water where the amount of dissolved oxygen is insignificant, or where it is at the saturation point ; or even in some cases in a Polytrichum-moss environment, where the plancton

is at its worst ; and larvae have been observed to survive to the first moult even in bog-moss (Sphagnum) water, of which the chemical reaction is the very worst. An ulterior conclusion suggests the greater importance of study of the conditions that determine the instinct of the pregnant female for a suitable breeding-place.

A. A.

Demina (N. A.) & Nicolsky (W. W.). Sur le développement des larves d'*Anophèles maculipennis* Mg. en fonction de la valeur chimique des collections d'eau et sur l'affinité élective des femelles pour ces eaux au moment de la ponte. [**Larval Development of *A. maculipennis*. Its Breeding Grounds.**]—*Russian Jl. Trop. Med.* 1928. Vol. 6. No. 7. French summary p. 452. [In Russian pp. 445–452.]

The following (in the French translation) are the authors' conclusions regarding the breeding-grounds of *Anopheles maculipennis*. Acid water with a considerable oxygen tension is not avoided by the parturient female, but the larvae do not live in it. Discoloured Sphagnum water poor in oxygen is also inhospitable to the larvae and *is* avoided by the parturient female. But water having a high calcium content, even if it be deficient in aliment, is very attractive to the parturient female and propitious to the larvae.

A. A.

Yoannovitch (G.). Contribution à la biologie de l'*Anopheles superpictus* dans la Serbie du Sud. [**Contribution to Biology of *A. superpictus* in S. Serbia.**]—*Bull. Office Internat. d' Hyg. Publique.* 1928. July. Vol. 20. No. 7. p. 1060.

In Southern Serbia Simitch has observed that *Anopheles superpictus* breeds only in streams. Consequently such larvae as are hatched early in the year are swept to destruction by the torrential floods of the spring season, so that the species flourishes only after the onset of the dry season, in July.

A. A.

Davis, N. C. **A Consideration of Variability in the Nyssorhynchus Group of the Genus Anopheles.**—*Amer. Jl. Hyg.* 1928. July. Vol. 8. No. 4. pp. 539–563. With 3 figs. & 5 graphs. [7 refs.]

This paper contains much tabulated statistical detail illustrating variability of the costal markings of *Anopheles albitarsis*, *A. argyrotarsis*, *A. tarsimaculatus*, and *A. rondoni* and variability in the amount of black marking of the 2nd segment of the hind tarsus of those species and *A. bachmanni*. Adults of some of these species have been reared from eggs laid by captured gravid females, and even among the offspring of a single mother the costal formula and the black on the said tarsal segment may differ from the maternal standard. The author inclines to drop *A. rooti* Brèthes and *A. evansi* Brèthes, and perhaps also *A. strodei* (*apud* Root) as specific designations.

A. A.

Davis (Nelson C.) & Shannon (Raymond C.). **The Blood Feeding Habits of** *Anopheles pseudopunctipennis* **in Northern Argentina.**—*Amer. Jl. Trop. Med.* 1928. Sept. Vol. 8. No. 5. pp. 443–447. [4 refs.]

In this study of the stomach-contents of *Anopheles pseudopunctipennis* 652 stomachs were selected from 1,600 specimens collected, nearly all in April, and practically all in houses of the poorer class of workmen, in two localities in the province of Tucuman, Argentina. By the precipitin reaction the specific determinations of the blood present in the stomach-material were as follows, in percentages: Man, 50·0; dog, 21·8; horse, 8·9; sheep or goat, 6·2; cow, 5·5; chicken, 3·2; hog, 2·5; cat, 1·8.

A. A.

Mayne (Bruce). **An Anopheline Mosquitoes** [*sic*] **as Host for the Parasites of Bird Malaria.**—*Indian Jl. Med. Res.* 1928. Oct. Vol. 16. No. 2. pp. 557–558.

In the course of experiments (here described, and tabulated in detail) with a malaria parasite of birds, provisionally identified with *Plasmodium praecox* of Grassi and Feletti, the author has found that *Anopheles subpictus* (=*rossi*) can harbour that parasite. Two out of forty-eight "wild" specimens (i.e. specimens captured in a room where several infected birds were kept), and five out of ninety-six laboratory bred and fed specimens, were found infected.

A. A.

Essed (W. F. R.). *Myzorhynchus sinensis* var. *separatus* Leic. of *Myzorhynchus hunteri* Strickland? [*M. sinensis* **var.** *separatus* **Leic. or** *M. hunteri* **Strickland?**]—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië.* 1928. Vol. 17. No. 2. Dutch Edition. pp. 306–310. [Foreign Edition, pp. 220–224.] With 13 figs. on 4 plates. [3 refs.]

Description of an Anopheles of the Myzorhynchus-group occurring in the Dutch East Indies (Rhio and Natuna Archipelago) which comes nearest to or is even identical with, *Myzorhynchus hunteri*, Strickland.

N. H. Swellengrebel.

Brug (S. L.). *Anopheles* (*Neomyzomyia*) *longirostris* **n. sp., (Diptera, Culicidae).**—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië.* 1928. Vol. 17. Pt. 2. pp. 424–425. Also in *Geneesk. Tijdschr. v. Nederl.-Indië.* 1928. Vol. 68. No. 2. pp. 278–279. With 4 figs. on 3 plates. [Med. Lab., Weltevreden.]

This [very questionable] "new species" is stated to be like *Anopheles tessellatus*, except for having the palpi shorter than the proboscis. It is based on a single specimen [which in respect of its legs complies with the wearisome formula of "a single mutilated female"].

A. A.

Chowdhury (K. L.). **The Larva of** *A. jeyporiensis* **James.**—*Indian Jl. Med. Res.* 1928. July. Vol. 16. No. 1. pp. 39–40. With 3 figs. on 1 plate. [3 refs.]

Corrected diagnosis and table showing distinctive features in comparison with the larvae of *Anopheles aconitus* and *philippinensis*.

A. A.

Lima (A. da Costa). *Nyssorhynchus bachmanni* (**Petrocchi, 1925**).—*C.R. Soc. Biol.* 1928. Nov. 2. Vol. 99. No. 30. pp. 1349–1350. [Oswaldo Cruz Inst., Rio de Janeiro, Brazil.]

Some trivial details of the larva described.

A. A.

de Vogel (W.). L'*Aedes egypti* dans les Indes néerlandaises. [*A. aegypti* **in the Dutch East Indies.**]—*Bull. Office Internat. d' Hyg. Publique.* 1928. June. Vol. 20. No. 6. pp. 897–898.

The specific identity of *Aëdes aegypti* in tropical America and in the Oriental region (which some people searching for an explanation of the non-existence of yellow-fever in the Oriental tropics have been inclined to question) has been experimentally settled by the collaboration of Brug in Netherlands-India and Hoffman in Cuba. Each sent to the other a batch of *Aëdes aegypti* eggs produced in his own locality; each reared adult insects from these eggs, and then paired in the one case the imported females with local males and in the other case the imported males with local females; with the result that in both cases fertile eggs were obtained which gave issue that leaves no doubt of the specific identity of the insects in these extremes of their range. [These experiments contradict the speculations of Legendre (this *Bulletin*, vol. 25, p. 274) regarding the existence of distinct "Oceano-Indian" and "Africano-American" races of *Aëdes aegypti*.]

A. A.

Barraud (P. J.). **The Distribution of '*Stegomyia fasciata*' in India, with Remarks on Dengue and Yellow Fever.**—*Indian Jl. Med. Res.* 1928. Oct. Vol. 16. No. 2. pp. 377–388. With 2 maps. [4 pages of refs.]

The author has made a collection, which must be about exhaustive, of the recorded occurrences of *Stegomyia fasciata* in the Indian Empire, and besides arranging them systematically, he has represented them graphically, along with the distribution of *Macacus rhesus* and *sinicus* and also of dengue fever, in sketch maps, and has usefully summarized the habits of the insect and the practical points of control.

A. A.

La Face (L.) & Raffaele (G.). Sulla presenza della *Stegomyia fasciata* nell' Italia meridionale e in Sicilia. [*Stegomyia fasciata* **in Southern Italy and in Sicily.**]—*Policlinico.* Sez. Prat. 1928. Oct. 29. Vol. 35. No. 43. p. 2095.

Considering the possibility of the spread of dengue from Greece the authors sought for *Aëdes aegypti* in certain towns of Southern Italy—Bari, Brindisi, Taranto—and the eastern coast of Sicily and Calabria. It was found in those towns, and in Sicily at Catania, Syracuse, and Taormina, but not on the coast of Calabria between Brancaleone and Bovelino. This mosquito, the authors state, is that described by Ficalbi in 1896 under the name *Culex elegans*.

H. Harold Scott.

NERI (Filippo). Sulla presenza di " Stegomyia calopus " nel basso Litorale Adriatico (Bari) e sua importanza epidemiologica. [**" Stegomyia calopus " on the Shores of the Adriatic and the Epidemiological Significance of its Presence.**]—*Ann. d'Igiene.* 1928. Oct. Vol. 38. No. 10. pp. 777–781. [Hyg. Inst., Univ., Bari.]

Should the disease be imported from Athens, the whole Adriatic littoral is favourable to the spread of dengue, the mosquito vector being present, while traffic is very active.

H. Harold Scott.

SINTON (J. A.). **The Synonymy of the Asiatic Species of** *Phlebotomus.*—*Indian Jl. Med. Res.* 1928. Oct. Vol. 16. No. 2. pp. 297–324. [8 refs.]

The author here confirms his statement that NEWSTEAD'S arrangement of species of Phlebotomus in two groups, according as most of the hairs of some or most of the abdominal terga either are erect or are recumbent, is correlated with certain internal structural characters, and he here restates his provisional classification of the Old World species in three series, namely: (1) those having the said hairs erect, and also having the spermathecae crenulate or striate; (2) those having the said hairs (posterior to the first abdominal tergum) decidedly recumbent, and also having spermathecae smooth in outline; and (3) a single " intermediate " species, *P. squamipleuris*, in which some specimens have a few erect hairs and others have no trace of them, but the spermathecae are constantly turnip-shaped, highly chitinized, and have a series of transverse rows of small spines. The first series is again segregated in two groups, namely, (*a*) those, like *P. papatasii* and 16 other species and varieties, in which the buccal armature and pigmented area are absent or rudimentary; and (*b*) those, like *P. hospitii* and 2 other species, in which the buccal armature and pigmented area are usually well developed. The second series is also arranged in two groups, in both of which usually the buccal armature and pigmented area are well developed, namely (*c*) those species and varieties (ten in number) having male genitalia similar to *P. minutus*; and (*d*) those, like *P. aquamirostris* and 4 other species not having male genitalia of that type. The third or " intermediate " series is represented for the present by a single species, *P. squamipleuris*, which also has the buccal armature and pigmented area well developed, besides some at present unique characters. (De MEIJERE'S *P. angustipennis* from Java is for the present excluded from the classification since its significant structural characters have not been described).

The main part of this paper, namely, the reasoned synonymy of each of the 34 Asiatic species and varieties of Phlebotomus included in the classification is too technical for abridgement.

A. A.

SINTON (J. A.) & BARRAUD (P. J.). **Improved Methods for the Identification of Some Species of** *Phlebotomus* **used in Experimental Work.**—*Indian Jl. Med. Res.* 1928. Oct. Vol. 16. No. 2. pp. 325–331. With 16 figs. on 2 plates. [9 refs.]

The authors discuss methods of dissecting Phlebotomus for observation of the pharyngeal armature and spermathecae in the identification

of species; also a modification of SMITH's method (this *Bulletin*, Vol. 22, p. 906) of breeding Phlebotomus from accurately identified mothers, as is necessary when large numbers are required for experimental work. They also review and figure the diagnostic features of five common species of the *papatasii* group used in the laboratory.

A. A.

ROUBAUD (E.). Asthénobiose et hibernation obligatoire provoquées chez *Phlebotomus papatasii* Scop.—[**Obligatory Hibernation in** *P papatasii.*]—*Bull. Soc. Path. Exot.* 1928. June 13. Vol. 21. No. 6. pp. 436–439. [1 ref.]

The author repeats his conclusion that when the gravid *Phlebotomus papatasii* ripens and passes her eggs quickly the issuing larvae complete their development quickly; but that when the ripening and dropping of eggs is delayed the development of the larval issue is delayed and discontinuous; in his own poetic language "the detention of the ripe eggs in the maternal organism imposes upon the descendants a weight of intoxication that overloads their fate."

A. A.

ADLER (S.) & THEODOR (O.). **The Presence of** *Phlebotomus chinensis* **in Syria.** [Correspondence.]—*Nature.* 1928. Oct. 13. Vol. 122. No. 3076. pp. 572–573.

The authors are of opinion that *Phlebotomus major* var. *chinensis* is a distinct species, and since this variety is implicated as a carrier of kala azar in Northern China they draw attention to the fact that they have recently discovered it in Aleppo.

A. A.

SINTON (J. A.). **Notes on Some Indian Species of the Genus** *Phlebotomus.* **Part XXIII.** *Phlebotomus clydei* **n. sp.**—*Indian Jl. Med. Res.* 1928. July. Vol. 16. No. 1. pp. 179–186. With 16 figs. on 2 plates. [3 refs.]

This new species is based on 11 females and 10 males from Waziristan. It is described in great detail and compared particularly with *Phlebotomus hospitii* and *P. christophersi*, from which it differs in the pigmentation and armature of the buccal cavity.

A. A.

SCHEWTSCHENKO (F. I.). Existiert oder nicht ein selbstständiger *Phlebotomus dubosquii.* [**Is** *P. dubosquii* **a Valid Species?**]—*Pensée Méd. d' Usbekistane.* Tashkent. 1928. June–July. No. 9–10. German summary p. 97. [In Russian pp. 27–30. With 4 text figs.]

The author, who has studied more particularly the species *Phlebotomus papatasii* and *P. dubosquii*, has observed in the male genital armature of a series of 542 males such variations as to justify him in concluding that no reliance can be placed on the armature of the claspers in the discrimination of species of this genus.

A. A.

PARROT (L.). Notes sur les phlébotomes. II. Sur quelques phlébotomes de la Bokhara. (U.R.S.S.). [**Bokharan Phlebotomi.**]—*Arch. Inst. Pasteur d'Algérie.* 1928. Mar. Vol. 6. No. 1. pp. 26–34. With 7 text figs. [4 refs.] [Pasteur Inst., Algiers.].

Phlebotomus minutus var. *sogdianus* and *P. major* var. *longicaudatus* are described, and Bokharan specimens of *P. sergenti* and its var. *lii*—all with some characteristic parts figured.

A. A.

PERFILJEW (P. P.). Zur vergleichenden Anatomie von Phlebotomus (Dipt. Psych.). [**The Comparative Anatomy of Phlebotomus.**]—*Ztschr. f. Parasitenkunde.* Berlin. 1928. Oct. 27. Vol. 1. No. 3. pp. 437–475. With 36 text figs. [19 refs.] [Zool. Inst., Milit. Med. Acad., Leningrad.]

A full and good account, plentifully and finely illustrated, and adequately cognizant of the work of other authors, of the anatomy of the mouth-parts, salivary glands, alimentary tract, and male and female reproductive organs, of the genus Phlebotomus.

A. A.

GRADY (A. G.). **Studies in breeding Insects throughout the Year for Insecticide Tests. I. House Flies** (*Musca domestica*).—*Jl. Econom. Entom.* 1928. Aug. Vol. 21. No. 4. pp. 598–604. [2 refs.]

The author describes his method and apparatus for maintaining a constant stock of fresh house-flies throughout the year for experimental use. The point to be particularly appreciated is that there is a critical time—the latter half of January, and the month of February —when larvae (and pupae) die if the larvae are kept on the usual pabulum of fresh horse-dung. This mortality can be averted by moistening the pabulum with a watery suspension of yeast.

A. A.

IRIARTE (David R.). Sobre un caso de nasomiasis a *Chrysomyia macellaria*. [**A Case of Nasal Myiasis by** *Chrysomyia macellaria*.]—*Rev. Med. y Cirug.* 1928. Apr. Vol. 11. No. 116. pp. 307–309.

There is nothing unusual in the report of this case from Caracas, which was treated with chloroform inhalations followed by antiseptics; 100 maggots of *Cochliomyia macellaria* were removed.

A. A.

SANDERS (H. C.). **Myiasis Dermatosa.**—*New England Jl. of Med.* formerly *Boston Med. & Surg. Jl.* 1928. July 5. Vol. 199. No. 1. p. 38.

The patient in this case of superficial myiasis was a three-months old infant, and the maggots, which were taken from inflamed pustules on the neck, were identified at the Washington Bureau of Entomology as *Wohlfahrtia vigil* [Sarcophagidae]. The case occurred in June, and two similar cases, due to the same species, have been reported in the same month from Toronto.

A. A.

BACCHELLI (G.) & TADDIA (L.). Ricerche nel sangue e negli organi interni della *Gambusie affinis.*—*Arch. Ital. Sci. Med. Colon.* 1928. Vol. 9. No. 8. 13 pp. With 3 figs. [11 refs.] [Inst. of Trop. Path., Univ., Bologna.]

BARRAUD (P. J.). A Revision of the Culicine Mosquitoes of India. Part XXIV. The Indian Species of the Subgenera *Skusea* and *Aedes*, with Descriptions of Eight New Species, and Remarks on a New Method for Identifying the Females of the Subgenus *Aedes.*—*Indian Jl. Med. Res.* 1928. Oct. Vol. 16. No. 2. pp. 357–375. With 42 figs. on 8 plates.

BIDEGARAY (Henri). Etude statistique et critique du parasitisme intestinal. La technique en coprologie. (Travail du Laboratoire de Parasitologie de la Faculté de Médecine).—60 pp. With 1 plate. [104 refs.] 1927. Paris. Librairie M. Lac, Editeur, 26 rue Monsieur-le-Prince (VIe Arr.).

BRUNÈ (G.). Sulla tricomoniasi intestinale.—*Arch. Ital. Sci. Med. Colon.* 1927. July. Vol. 8. No. 7. pp. 375–387. [8 refs.]

BUXTON (Patrick A.). An Aspirator for Catching Midges.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1928. Aug. 22. Vol. 22. No. 2. pp. 179–180. With 1 text fig. [London School of Hyg. & Trop. Med., London.]

CASTEX (M. R.) & GREENWAY (D.). Indice protozoárico intestinal humano.—*Arch. Argentinos enferm. Aparato Digest. y Nutric.* Buenos Aires. 1928. Vol. 4. No. 1. pp. 43–48. With 5 figs. (1 coloured plate.) [5 refs.]

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